CA2ALHT
73M73
C.2

CA2 ALHT 1973M73
Multi-Disciplinary Evaluation of the Edm
onton Parkway Ring, Sept. 1973 2
3 3398 00312 1786

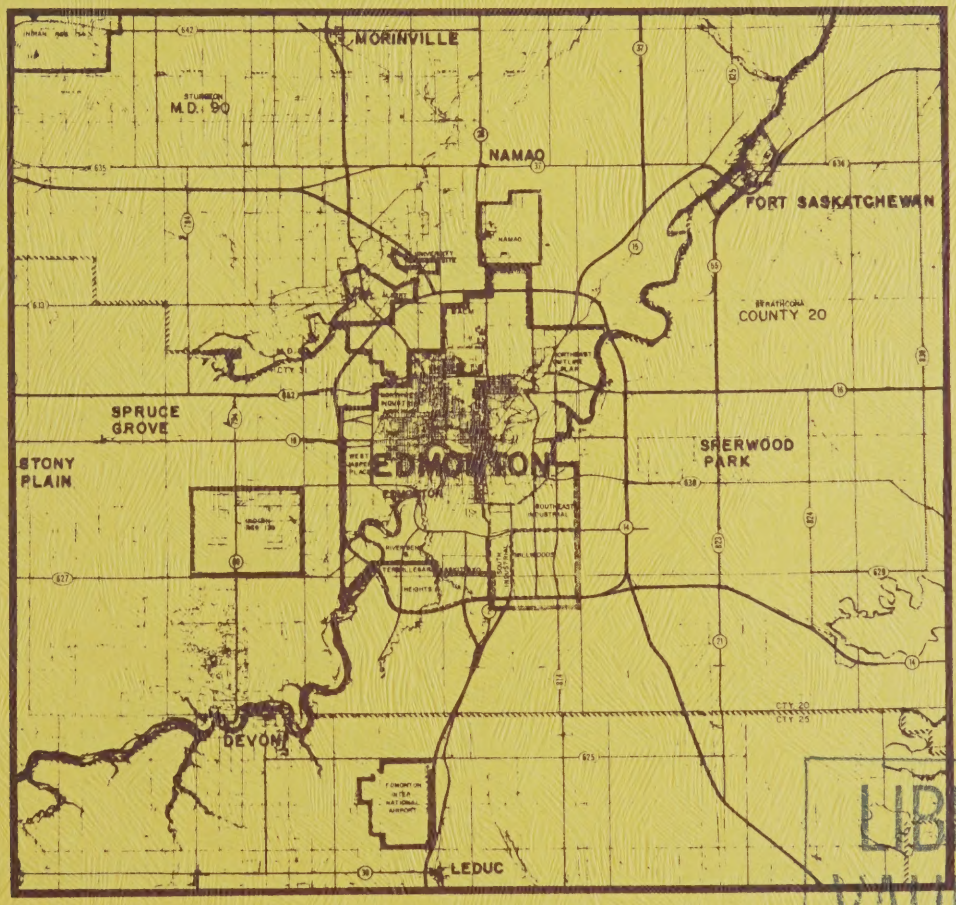
LEGISLATURE LIBRARY
JAN 2 1974
EDMONTON

A Multi-Disciplinary Evaluation of the

EDMONTON PARKWAY RING

for the

PROVINCE OF ALBERTA
DEPARTMENT OF HIGHWAYS AND TRANSPORT



LIBRARY
VAULT 19

DeLeuw Cather consulting engineers and planners

in association with

L. W. Downey Research Associates Ltd.

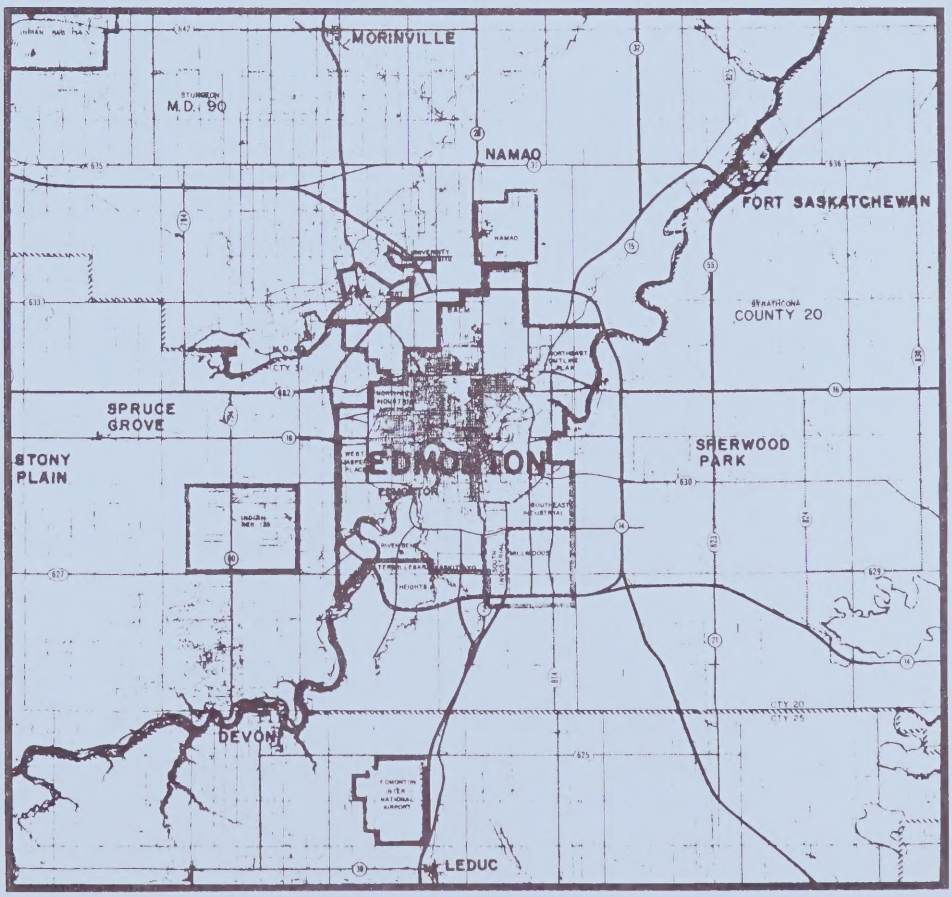
SEPT. 1973

Digitized by the Internet Archive
in 2026 with funding from
Legislative Assembly of Alberta - Alberta Legislature Library

A Multi-Disciplinary Evaluation of the

EDMONTON PARKWAY RING

for the
PROVINCE OF ALBERTA
DEPARTMENT OF HIGHWAYS AND TRANSPORT



DeLeuw Cather consulting engineers and planners

in association with

L. W. Downey Research Associates Ltd.

SEPT. 1973

Digitized by the Internet Archive
in 2026 with funding from
University of Alberta Library

https://archive.org/details/ableg_33398003121786

De Leuw Cather

CONSULTING ENGINEERS AND PLANNERS

September 24, 1973

Mr. V.E. McCune, P. Eng.,
Deputy Minister,
Department of Highways and Transport,
Room 302 Highways Building,
106th Street and 97th Avenue,
Edmonton, Alberta.

Dear Mr. McCune:

We are pleased to submit our report for the Edmonton Parkway Ring. The report evaluates the proposed Ring Road corridor concept and location in terms of environmental, social and transportation engineering considerations. Conclusions and recommendations are based on an analysis of input received by the multi-disciplinary study team from a significant number of municipal and provincial representatives.

The cooperation and assistance by the government departments and municipal agencies is sincerely appreciated. We are grateful to have been afforded the opportunity to undertake this challenging assignment.

Respectfully submitted,

DE LEUW CATHER, CANADA LTD.,

S.I. Donat, P. Eng., Associate,
Project Director

R.P. Wozniak, P. Eng.,
Project Manager

TABLE OF CONTENTS

	Page
INTRODUCTION	1
Objective	
Scope	
Study Approach	
SUMMARY AND RECOMMENDATIONS	4
HISTORY OF EDMONTON RING ROAD	10
NEED FOR THE RING ROAD	13
Function of the Ring Road	13
Role in Urban Transportation	14
Traffic Considerations	16
Land Use Considerations	27
Multiple Use of Corridors	28
Metropolitan Region Considerations	29
OPTIMUM LOCATION	31
Land Use Controls	31
Intra-Urban Traffic	34
Bridge Spacing	34
ENVIRONMENTAL IMPACT ANALYSIS	36
Soil Material	37
Vegetation	38
Wildlife	39
Water	41
Visual Analysis	43
Agricultural Land	45
Recreation	46
Air Pollution	50
Noise Pollution	51
Susceptibility to Snowdrifting	53
Staging Considerations	54
Utilities	55
Cost	56

Page

SOCIO-ECONOMIC ANALYSIS 58
Summary 58
Introduction 61
Objectives of the Ring Road 63
Socio-Economic Variables Related to Ring Road Development .. 65
Costs 79
Potential Benefits 85
Other Considerations 96

LIST OF EXHIBITS

	Exhibit No.
KEY PLAN	1
PROJECT STUDY ORGANIZATION	2
BREAKDOWN OF TEAMS	3
ALTERNATIVE CORRIDOR CONCEPTS	4
RING ROAD FUNCTION	5
TRAFFIC VOLUMES WITHOUT RING ROAD	6
TRAFFIC VOLUMES WITH RING ROAD	7
LEVELS OF SERVICE A,B, and C	8
LEVELS OF SERVICE D,E, and F	9
TRUCK TERMINAL LOCATIONS	9A
MULTIPLE USE CORRIDOR	10
LAND USE PLAN	11
TRAFFIC SIMULATION MODELS	12
RIVER CROSSING SITES	13
SOUTHWEST RIVER CROSSING	14
SOIL MATERIALS	15
VEGETATION	16
WATERFOWL LAND CAPABILITY	17
WATER COURSES AND DRAINAGE BASINS	18
SLOUGHS AND AREAS OF POOR SOIL DRAINAGE	19
LANDSCAPE ABSORPTION	20
AGRICULTURAL SOIL CAPABILITY	21
RECREATION AREAS AND CAPABILITIES	22
RECREATION POTENTIAL OF RING ROAD CORRIDOR	23
NOISE POLLUTION	24
TYPICAL BUFFER TREATMENT	25
SUSCEPTIBILITY TO SNOWDRIFTING	26
SNOWDRIFTING	27
UTILITIES	28
GAS AND OIL PIPELINES	29

INTRODUCTION

INTRODUCTION

Objective

In March, 1973, the Department of Highways and Transport retained De Leuw Cather to carry out a multi-disciplinary evaluation of the Edmonton Ring Road concept. This has consisted of reviewing work carried out to date by the Department with particular reference to environmental and socio-economic impacts, and to identify problem areas, if any, with regard to the proposed Corridor.

Scope

There are two phases in the planning process for a transportation facility:

Phase I. Concept and Corridor Location

The concept and general corridor location within which a transportation facility may be located are analysed. A corridor is defined as a band of land approximately one-half mile in width.

Phase II. Route Location Within the Corridor

If the basic concept and general location are accepted, then details with regard to final alignment within the corridor and right-of-way requirements are determined. Public involvement is generally introduced in this phase.

Phase I - "Concept and Corridor Location" is covered in this Study. In addition to an overview of work by the Department, an analysis of a number of factors relative to a multi-disciplinary study has been carried out. These factors can be broadly grouped as follows:

Social
Economic
Environmental
Aesthetic

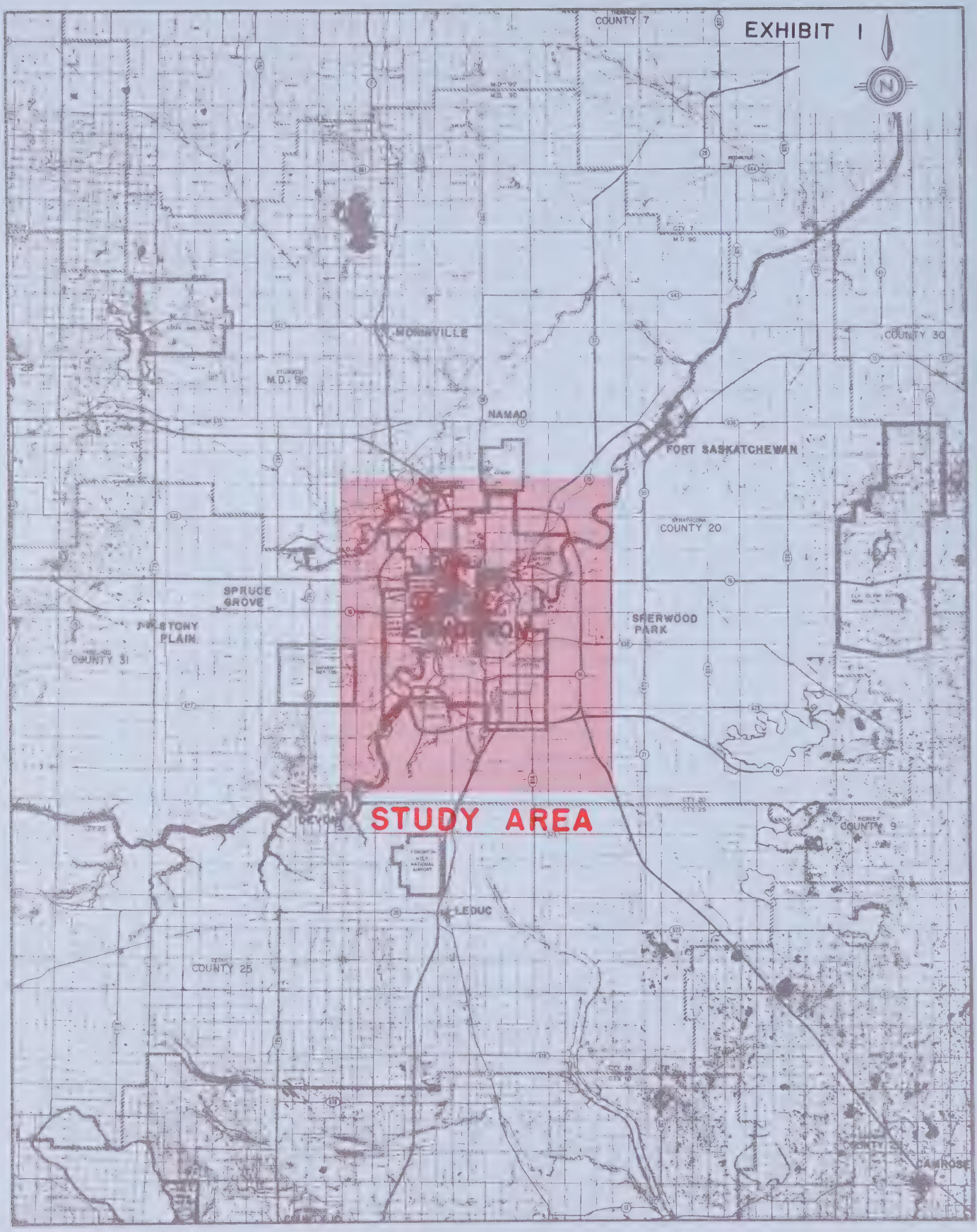


EXHIBIT 1
N
COUNTY 7
M.D. 90
MORINVILLE
COUNTY 30
NAMAO
FORT SASKATCHEWAN
COUNTY 20
SPRUCE GROVE
STONY PLAIN
COUNTY 31
SHERWOOD PARK
STUDY AREA
DEVON
COUNTY 9
LEDUC
COUNTY 25
CAMROSE
0
8 Mi.
Scale

KEY PLAN

Study Approach

A multi-disciplinary project team was formed to work with and collect data from a number of other teams as indicated in Exhibits 2 and 3.

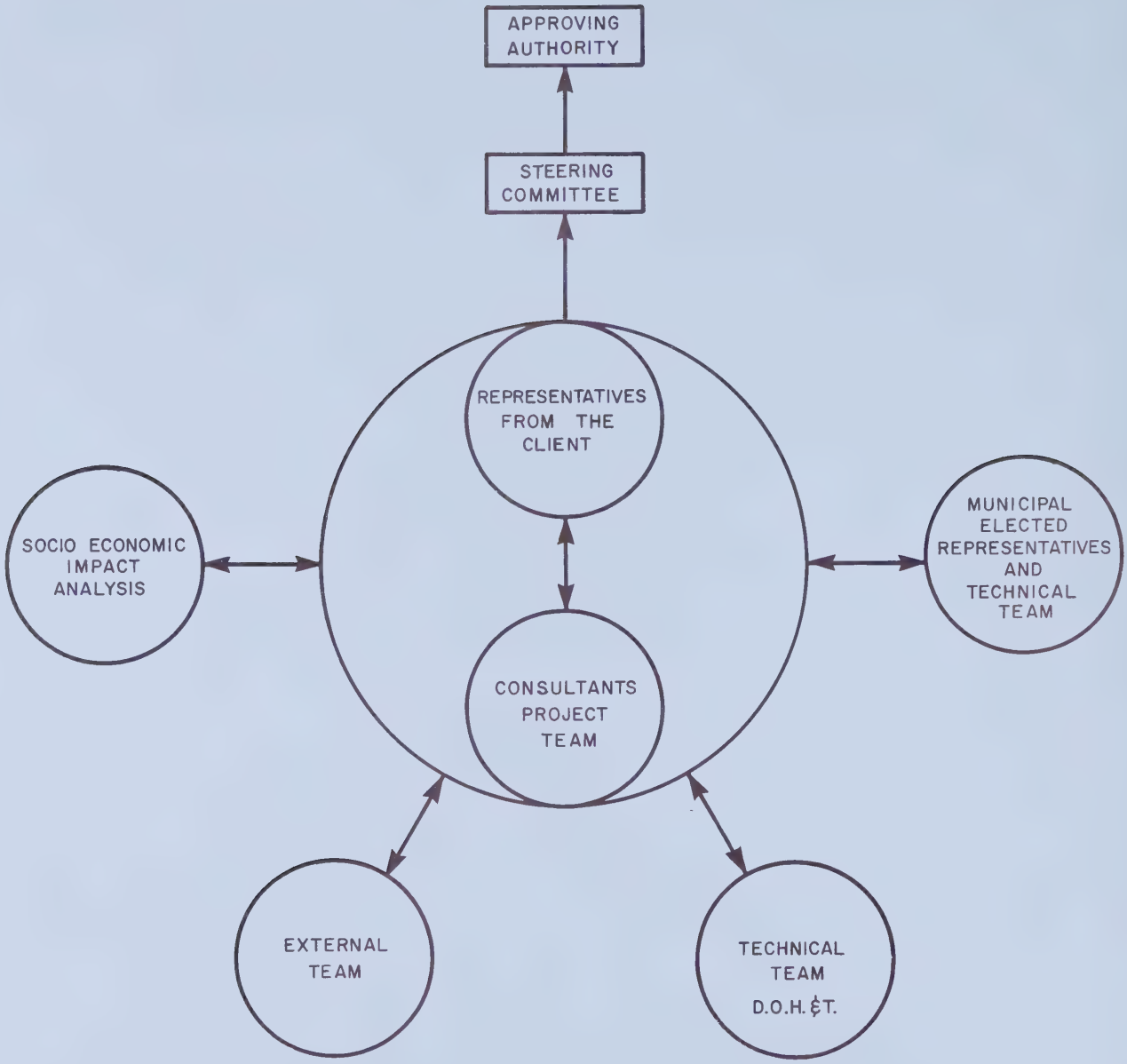
The project team included specialists in the following disciplines:

Ecology
Socio-Economics
Landscape Architecture
Parks and Recreation Planning
Urban Planning
Traffic and Transportation Engineering

During the course of the Study numerous meetings to collect data and/or to receive comments regarding the concept were held with representatives from the following Provincial Government Departments, Local Taxing Authorities and Regional Agencies within the Study Area:

Department of Agriculture
Department of Environment
Department of Highways and Transport
Department of Lands and Forests
Department of Municipal Affairs (Task Force)
Edmonton Regional Planning Commission
City of Edmonton Transportation Planning Department
City of Edmonton Parks and Recreation Department
City of Edmonton Planning Department
City of Edmonton Utilities and Engineering Committee
County Council of Parkland
County Council of Strathcona
Council of Municipal District of Sturgeon
Town Council of St. Albert
Major Utility Agencies

The Study has been based on an examination and assessment of existing



PROJECT STUDY ORGANIZATION

MUNICIPAL ELECTED REPRESENTATIVES AND TECHNICAL TEAM

CITY OF EDMONTON
COUNTY OF STRATHCONA
COUNTY OF PARKLAND
M.D. OF STURGEON
TOWN OF ST. ALBERT

TECHNICAL TEAM

DEPT. OF HIGHWAYS & TRANSPORT
- A. PLANNING BRANCH
- B. BRIDGE BRANCH
- C. CONSTRUCTION & DESIGN BRANCH

EXTERNAL TEAM

EDMONTON REGIONAL PLANNING COMMISSION
DEPT. OF LANDS AND FORESTS
DEPT. OF THE ENVIRONMENT
DEPT. OF MUNICIPAL AFFAIRS
DEPT. OF AGRICULTURE
MAJOR UTILITY COMPANIES
- A. NORTHWESTERN UTILITIES
- B. ALBERTA POWER
- C. CALGARY POWER
- D. A.G.T.

PROJECT TEAM

DE LEUW CATHER, CANADA LTD.
L.W. DOWNEY RESEARCH ASSOCIATES LTD.

BREAK - DOWN OF TEAMS

data, mapping, studies and reports, and general information gathered at the above meetings. Generation of new data has been kept to a minimum because of the time schedule. However, additional traffic data has been generated so that the effects of traffic with and without the Ring Road could be analysed and graphically illustrated.

A Steering Committee, consisting of one member from each of the five Government Departments listed above, was formed to oversee the work by the Study Team. The Study Team reported directly to the Steering Committee at the conclusion of each phase of the Study.

SUMMARY and RECOMMENDATIONS

SUMMARY AND RECOMMENDATIONS

To rationally evaluate the Ring Road concept it is essential to analyse a number of factors on an individual basis which set forth the implications of the total concept. In the final judgment, however, these factors must be jointly considered.

Transportation Engineering Considerations

Ultimately the Ring Road must meet the challenge of making a significant contribution to the overall transportation network of the City and Region. It must be considered as a basic component of the transportation system rather than a separate entity with a justification of its own. In this light, the Ring Road is not to be viewed as an alternative to, say, urban rapid transit or bus systems, but rather as a mechanism for making those systems work more effectively. It will have to be carefully coordinated with the other modes of transport, and as well with other elements of the transportation network such as penetrator roads and major arterials. It follows that to successfully integrate the Ring Road with the City system, it must be planned to accommodate future transportation needs of the City.

Traffic projections for the Ring Road have assumed a heavy shift to alternative modes of transportation in the City of Edmonton. The result is that the traffic projections for the Ring Road are conservative, and could be significantly higher if a high level of public transit usage is not achieved.

To evaluate the need for the Ring Road in terms of traffic, one has to fully understand its functions. It will not materially lessen traffic congestion during the peak periods, but by achieving more even distribution of both external and internal traffic, it will in fact, improve traffic conditions on the arterial roads leading into the City. At the same time, it will minimize the impact of noise and air pollution

on the inner city and residential areas by providing more efficient routes for people to get to the same destination.

Truck traffic, with its associated noise pollution, is one of the major concerns in cities today. Edmonton is primarily a terminal city for truck traffic. The re-distribution function of the Ring Road will minimize this impact to some extent. The fact remains, however, that many of the trucks have an inner city destination. A Ring Road will not remove the requirement that goods be transported to commercial centres within the city core. It will, however, attract commercial and industrial developments to the periphery of the city, particularly those which do not need to be in the inner city. The possibility of dispersing truck terminals, warehouses, etc. away from the inner city to land contiguous to the Ring Road will provide a substantial relief to the inner city in terms of traffic and the general environment.

The bypass function of the Ring Road is probably modest in relation to its other roles, but it is significant that heavy trucks will have the opportunity to bypass the City.

At the regional level, the Ring Road provides a means of integrating the urban transportation system with primary and secondary provincial highways.

Ring Roads, such as the one proposed for the Edmonton area, are common to many cities in North America. Most cities of 500,000 population or more have a Ring Road or some semblance of one. For cities where Ring Roads have been built, or segments put into operation, heavy traffic volumes have been attracted to the facility which otherwise would be on arterial streets within the inner city or residential districts. This definitely should be no surprise to the City of Edmonton where the "Inner Ring Road", of which segments have already been built and placed in operation, is experiencing high traffic utility.

Multiple-Use Concept

An important attribute of the Ring Road concept is the inherent potential for integrating other uses into the total right-of-way, hence the "Multiple-Use Corridor" concept. The Corridor should be sufficiently wide to provide for a highway facility, other modes of transport, utility lines, and environmental buffer zones as required due to adjacent land use. The resultant of combining rights-of-way for utility lines with the buffer zones is that enough land would be available for a number of other uses. Perhaps the most significant use for such land would be for parks and recreation purposes. If a large amount of land is in fact required for the buffer zone in conjunction with the development of a Ring Road system, then a host of recreational opportunities will present themselves. This situation will significantly affect the direction, nature and scope of parks and recreation planning in the region. Accessibility to recreational areas would be improved by the Ring Road.

Land Use

One of the fundamental questions which has to be answered is how the Ring Road will affect the various options for urban growth of Edmonton. A Ring Road generally is compatible with the various forms of growth and able to provide full flexibility in terms of expansion. The growth trend in the Edmonton Region includes perimeter expansion plus satellite towns. Thus, residential land use plans are consistent with the concept of a Ring Road and will tend to be reinforced by a Ring Road system.

If anything, the Ring Road will encourage the further expansion of the satellite towns which are already experiencing a much higher percentage of population growth than the City itself. This reflects the goals set for the Region by the Edmonton Regional Planning Commission with regard to "decentralization".

In this context the Ring Road will definitely not be a barrier to urban development and there appears to be little doubt that such development will eventually reach and extend beyond the proposed Ring. The important thing here, however, is to control this development to the best

advantage and well-being of all citizens. Close liaison will be required between Provincial and City Government in the interest of maximizing the benefits of changes in urban growth forms.

Location

With regard to the question of optimum location of the Ring Road, it should be noted that the Corridor location in general terms is well defined by existing plans and developments, with the three major features being the Town of St. Albert to the northwest, Namao Airport to the north and Sherwood Park to the east. The Ring Road is compatible and well integrated with the various Outline Plan Areas. In addition, there are a number of engineering and environmental considerations which are quite significant in terms of the location and they are discussed in more detail later in this Report. There is, of course, the consideration that the Ring Road should be positioned near to the built-up areas or it will lose its attractiveness to the urban dweller.

All local taxing authorities in the Study Area have adopted the corridor concept and location, and have generally indicated strong support for the concept. The selected location of the corridor is optimum in terms of the physical controls, its functions and land-use relationships.

Impacts

Impacts with regard to the following factors have been analyzed: surface water, water quality, vegetation, soil, wildlife, landscape absorption, recreation areas, agricultural land, noise and air pollution, susceptibility to snowdrifting, staging considerations and costs. During the course of analysis, it has been found that the impacts in general varied from minimal to moderate with noise pollution being the most serious concern. A depressed facility in conjunction with a "buffer zone" would have to be investigated in this respect at isolated locations. Other factors fairly significant without affecting the location within the broad Corridor are: air pollution, visual intrusion and the effect

on agricultural and recreational capability of the land.

Harmful effects created by the Ring Road can be reduced considerably by special treatments during design and construction.

It can be concluded that the Ring Road, if coordinated with the City and Regional Transportation System and developed as a multiple-use Corridor, will improve the flow of traffic, and will contribute to the general environment and to the amenities enjoyed by the citizens in the Edmonton Area. The Corridor concept is a proposal to plan ahead and to set aside land now for future transportation and other uses. Protection of right-of-way now will eliminate the disastrous effect of having to carve out corridors after urbanization takes place.

Cost

The total estimated construction and land cost for the ultimate facility is between 126 and 146 million dollars, depending on the right-of-way width. The initial expenditure would be 20 million dollars for land based on a 350' wide right-of-way, and 20 million for construction of a 2 lane at-grade facility. The right-of-way required for 'buffer zones' and/or multiple use would be additional to the basic cost.

RECOMMENDATIONS

Based on data collected, analysis of the social, economic and environmental impacts, and a review of transportation engineering considerations, the following recommendations are offered with respect to the Edmonton Ring Road:

1. The concept of a Ring Road Corridor for the Edmonton Area be adopted under the following conditions:
   (a) that the corridor be planned and integrated with the overall transportation requirements for the City of Edmonton.
   (b) the corridor be developed as a multiple-use corridor with emphasis on landscape treatment and integration with recreational areas on an urban and regional scale.

(c) that appropriate steps be taken by the respective Government Departments, City Departments, and Local Taxing Authorities to establish right-of-way requirements for a multiple-use corridor.

(d) that a policy be developed to protect and acquire right-of-way needed to accommodate a multiple-use corridor.

2. The location of the corridor as proposed by the Department of Highways and Transport be accepted under the following conditions:

(a) adequate noise attenuation be achieved either by buffering, depression, or a combination of both, to meet the noise by-law requirements set by the City of Edmonton.

(b) further examination be carried out for the northeast River Crossing, with the objective of minimizing impact on the recreational capability of the adjacent area.

(c) that adequate access to farm units adjacent to the corridor be provided and severances be minimized.

3. (a) A full-scale multi-disciplinary study should be undertaken with the active participation of all concerned Government Departments and local authorities to define the final alignment within the corridor.

(b) In the follow-up stages public involvement should be initiated to ensure that the facility and its location are accepted.

HISTORY
of
EDMONTON RING ROAD

HISTORY OF EDMONTON RING ROAD

Over the past years much thought, work and study has been undertaken towards planning and implementation of perimeter roads for the City of Edmonton.

1951 - Definitive consideration was being given to an Outer Ring Road "to provide a link with arterial highways converging upon the City of Edmonton, and to afford alternate routes for traffic desiring to bypass the built-up portions of the City." In that year the Edmonton Regional Planning Commission made a proposal for a Ring Road to the Provincial Government and requested that it form part of the Provincial Highway System.

1953 - Three major issues had to be resolved at that time:

1. Clarification of the Department of Highways' policy on the Ring Road.
2. An outline to the Minister of the various Commission recommendations on the subject since its inception in December, 1950.
3. Consideration of ways and means of coordinating the efforts of the Commission with its member municipalities in planning for the Ring Road.

These issues were to be resolved as follows:

1. In the matter of policy, the Minister intimated that the road should be built as the need for it is demonstrated.
2. In determining the location, it was agreed that both the recommendations of the Commission and the ideas of the Department should be examined in an effort to obtain the best possible location.
3. If an overall plan agreeable to all parties was found for the Ring Road, the Commission might, through its subdivision administration, assist considerably by reserving right-of-way in subdivisions falling within the

path of the road by calling for setbacks and general control over adjacent development.

1956 - The Edmonton Regional Planning Commission continued its efforts to determine the location and design of a Ring Road so that future subdivisions and developments would not obstruct the acquisition of right-of-way. A Ring Road Plan, as indicated in Exhibit 3, was developed and approved for Metropolitan Edmonton. This Ring Road is what is considered to be the "Inner Ring Road" for the City now.

1963 - The Metropolitan Edmonton Transportation Study (METS) was completed and it identified a new Outer Ring Road, the new location being further removed from the City centre.

1966-67 - A Regional Rural Road Study was carried out by the Edmonton Regional Planning Commission and member communities in cooperation with the Department of Highways and Transport. The Study defined a Secondary Road System for the Province. As a result of the Study it became evident that there was a need for further study to coordinate the Secondary Roads within the City.

1972 - As follow-up to the Rural Road Study, the Province and the Edmonton Regional Planning Commission embarked on the Edmonton Area Study to integrate the Rural and Urban roadways. The purpose of the study is to designate roadway corridors within the Metropolitan area and integrate short and long range proposals outside of the City with those near and within the City. This report is to be available in 1973.

1972 - The City of Edmonton completed the General Transportation Plan Position Paper. Included in its Conceptual Plan was the concept of an Outer Ring Road bounding many of the present outline plan areas of the City.

1973 - The Department of Highways and Transport examined some alternative alignments for the proposed Outer Ring Road, particularly in the south and northeast.

1973 - The Transportation Chapter of the General Plan for the City of Edmonton is presently being completed. The Chapter is to outline the general policy for transportation within the City.

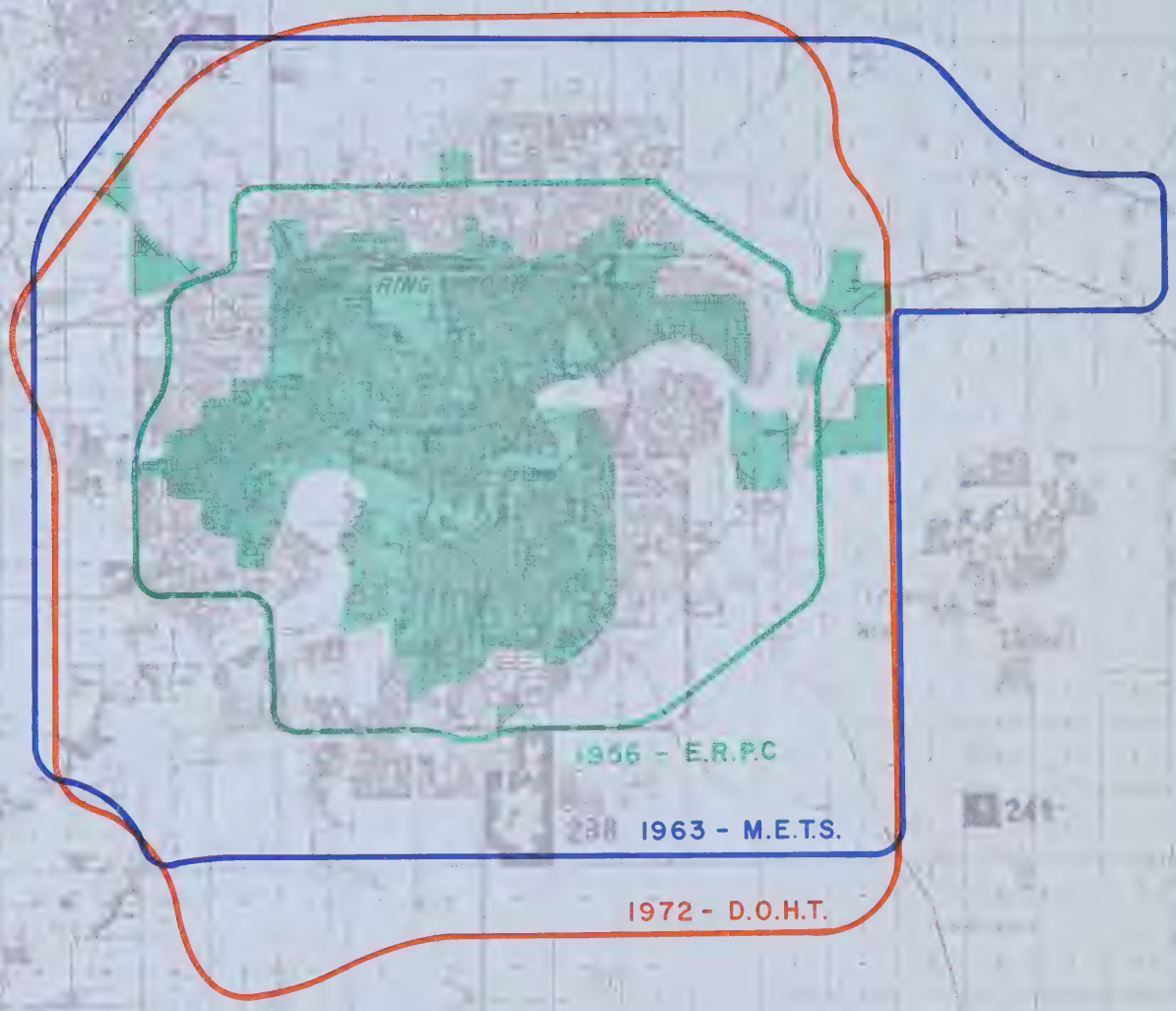
1973 - An Alternative Growth Study is being undertaken by the Edmonton Regional Planning Commission for the Metropolitan Region.

Summary

The Ring Road Concept in the Edmonton Area is not really new. More than twenty years have elapsed since the first proposal for a Ring Road was made. Through the years urban development has outgrown the original "Outer Ring" and it is now designated as the "Inner Ring" for the City of Edmonton. In turn, a new "Outer Ring" location was evolved in 1963 as the result of the METS report; the new location reflecting the needs of a larger urban area and population.

Basic issues in the past were: the need for the facility; its location; and methods of protecting right-of-way, much the same as the issues at present. History indicates that transportation corridors were required in the past and will be required in the future to keep in step with urban growth.

EXHIBIT 4



1956 URBAN DEVELOPMENT

ALTERNATIVE CORRIDOR CONCEPTS

NEED
for the RING ROAD

NEED FOR THE RING ROAD

It is extremely difficult to prove or disprove, in absolute terms, the need for a transportation facility which would directly or indirectly serve a large population. In the case of the Ring Road proposal, the problem is further complicated due to the far-reaching implications the system would have on a major metropolitan area. The need can best be examined in terms of a number of factors which demonstrate the ability of the proposed corridor to provide service to the general public; the effects on traffic with and without the Ring Road; and the effects it would have on development.

Function of the Ring Road

The primary function of a Ring Road is to reduce the concentration of vehicle trips on arterial streets and improve the convenience of access to the different areas inside and outside the City. Its traffic function, as considered in this study, is to serve three trip types, listed below in order of significance:

(a) Intra-urban trips, originating and terminating within the Metropolitan Area.

(b) Inter-urban trips, originating outside the Metropolitan Area and terminating inside, and vice-versa.

(c) Bypass trips, originating and terminating outside of the Metropolitan Area.

Intra-urban trips, in the case of Edmonton, will initially be the most significant because a large percentage of the Metropolitan Region population lies within the proposed corridor as well as major industrial and commercial development. Representative intra-urban trips would be by people living within the City and working and/or shopping within the City.

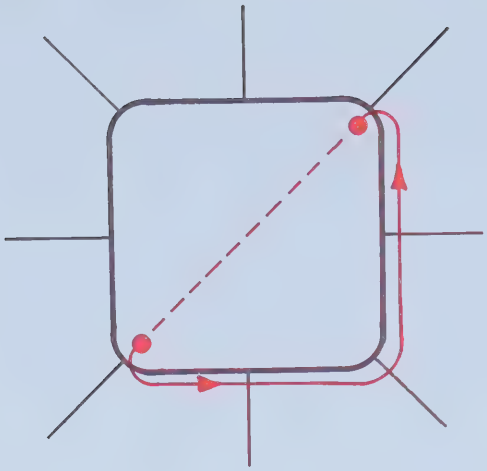
Inter-Urban trips originate in the outlying areas, such as St. Albert, Sherwood Park, Leduc or Spruce Grove, etc. and mainly are work trips for people residing in these communities and working in the City.

Inter-urban trips are largely a function of the population living outside the immediate area of the City. Although the inter-urban trips are not significant in comparison to intra-urban trips at the present time, it must be emphasized that the residential development outside of the Ring will heavily influence traffic projections for the Ring Road. Experience in recent years has indicated that there has been rapid growth in areas outside the City, and present forecasts show that this trend will be continued in the foreseeable future, regardless of the status of the Ring Road. Based on 1971 figures, the population residing outside the City of Edmonton but within the Metropolitan Region was approximately 45,000; the 1981 projection is about 122,000 outside the City. Other modes of transport have less opportunity to affect inter-urban trips than intra-urban trips. Thus,it can be concluded that the Ring Road function to accommodate traffic from outside the City to within the City, will continue to increase at a high rate.

Bypass trips are predominantly related to trucks. Edmonton and Calgary are major terminals for truck trips, and thus Bypass traffic is not very significant. The present major Bypass movement is between Highway 2 South and Highway 16 West. The lowest volume of Bypass traffic is in the north-south direction, although an increase can be expected with further development of the Athabasca Tar Sands.

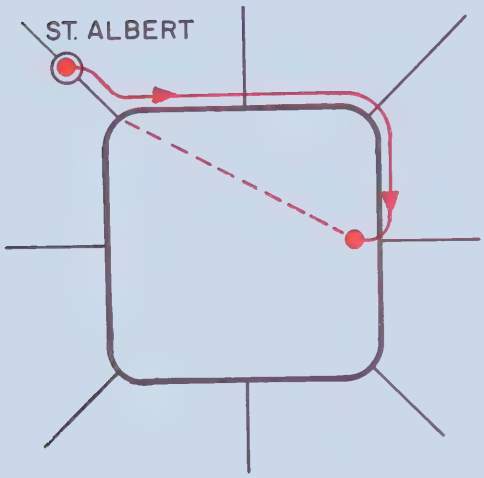
Role in Urban Transportation

The conceptual plan developed by the City of Edmonton Transportation Planning Department in their Position Paper on Transportation has moved the Central Ring Road of the original METS plan outward and designated it as an Inner Ring Road. The roads in the original radial road network are now designated as penetrator roads to the Inner Ring Road. The Inner Ring Road forms the third element in this conceptual plan complimenting the Outer Ring Road and penetrators.



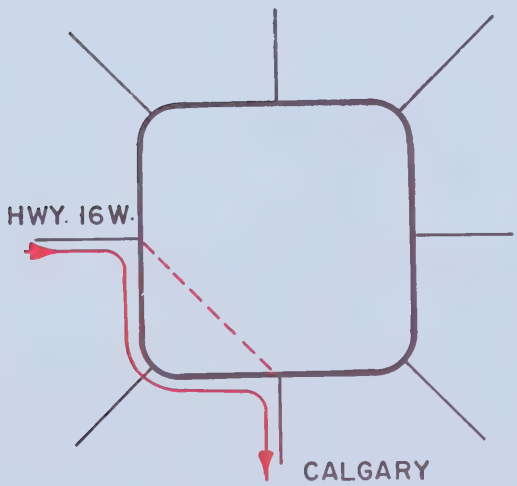
A

INTRA-URBAN



B

INTER-URBAN



C

BYPASS

RING ROAD FUNCTION

In the original METS study in 1963, little importance was given to the Outer Ring Road. Now, however, with the new conceptual plan the Outer Ring Road becomes a significant and integral part of the overall transportation picture. Even with an Outer Ring Road the City Planning Department recognizes that the conceptual plan "fails to satisfy the peak hour traffic demands of the central area and of the University of Alberta Health Sciences Complex". Without an Outer Ring Road an overloading of the Inner Ring could be expected to occur, which in turn, would put a much greater pressure on roads within the inner city.

With the development of penetrator roads outlined in the Position Paper, a linkage would be provided to the City's internal transportation system from the Outer Ring Road. The Inner Ring Road will provide convenient connection between the penetrator roads and the City's internal transportation routes, and a bypass route for traffic destined from one part of the inner city to another.

It can be stated that the Outer Ring Road will not solve the traffic problems within the inner city. However, there would very likely be a greater potential to introduce other modes of transport to ease the congestion, particularly in the downtown area. Traffic projections for the Ring Road have assumed heavy reliance on good, well patronized public transportation as a vital component of the City's overall transportation system.

Circumferential or Ring Roads are common to many cities in North America. Most cities examined of 500,000 population or more have an Outer Ring Road or some semblance of one. In cities where ring roads have been built, or segments put into operation, heavy traffic volumes which otherwise would utilize arterial and residential streets, have been attracted to them, Thus, the value of the Ring Road has been clearly established as an important element of the total multi-modal transportation network.

Although certain differences in pattern are present, some of which may be categorized as grid or irregular, all Ring Roads may be considered as broadly fitting the pattern of radials and loops.

Traffic Considerations

Purpose and General Approach

The purpose of this part of the Study has been to examine the impact of the proposed Outer Ring on the traffic volume patterns of the City. There was no attempt to justify the necessity or desirability of an Outer Ring based on the traffic information alone.

In the general approach to the study of traffic, a series of meetings were held with representatives of several City and Provincial Departments. These meetings were designed to familiarize the Study Team with the issues and obtain background. Next, the source data that was referred to in the meetings was obtained and reviewed. Following this, more detailed technical discussions were held with the various officials and network assignments were requested and completed. These assignments were then examined and observations made on the effect of the proposed outer parkway ring.

Source Data

All the data used in this review were obtained from the Provincial Department of Highways and Transport or from the City of Edmonton. Data is based on work trips only, and no truck trips have been included.

In a transportation study there are a number of distinct steps or phases that are normally included. These are shown in the accompanying Figure 1. In this section, comments will be made on the data used in this review in the context of the transportation planning process. These comments can be made under the following headings:

(a) Base Year Inventory
(b) Future Year Forecasts
(c) Future Travel Forecasts
(d) Plan Preparation

(a) Base Year Inventory

The inventory of the existing streets in the Study Area, including their physical standards, classifications and existing traffic volumes was available but not as a comprehensive entity. No attempt was made to compile this inventory. It was sufficient for the purposes of this Study to know the major arterial street network and how it could be expanded and incorporated into a future network.

Population and employment are two very important parameters. When they are quantified and spatially distributed, they constitute a major influencing factor in transportation planning. In Edmonton, the base year data was available for several time periods in varying degrees. The 1967 and 1968 data were generally used in the traffic work.

The DOHT supplied the results of their 1968 external cordon origin and destination roadside interview survey. This survey had limitations in that it did not treat St. Albert and Sherwood Park as external traffic zones. The traffic data available for the City of Edmonton were based on their 1967 origin and destination survey. The City of Edmonton analysis of this data was confined to the work trip purpose only and all analysis was for areas contained within the City boundary, again excluding Sherwood Park and St. Albert. Thus, only intra-urban work trips were analysed.

(b) Future Year Forecasts

The information available to the Study team consisted of the forecasts published in the General Plan, the Position Paper, and the Preliminary Thirty Year Passenger Transportation Study for the City of Edmonton. The information in these documents were the basis for all future volumes.

(c) Future Travel Forecast

The estimates of future travel were prepared by the DOHT and the City of Edmonton. The 1968 external O.D. survey of the Provinces was forecast to the year when the population of the study area would be about 1,000,000. The DOHT modified the survey data to include the traffic effect of St. Albert and Sherwood Park.

The 1967 City of Edmonton traffic data was similarly expanded to a horizon year population of 1,000,000 which would occur when the new Outline Plan Areas are totally developed. This trip data was for work trips only.

Therefore, for this Study it was necessary to combine the DOHT's external trip table and the City's internal trip table to produce a target year trip table for review purposes. Thus the traffic volumes assigned were representative of external to internal, internal to external, and through trips, plus internal work trips. Prior to assigning these trips to a road network, it was necessary to split the internal person trip interchanges into the various modes of travel; namely, auto and transit. The modal split was based on the assumption that a rapid transit system would be in operation by the time the population reached one million and would be located in the corridor defined in the City of Edmonton General Transportation Plan Position Paper. Modal choice estimated for all inter-zonal work-trip movements were developed by the City from value judgments based on the 1967 origin-destination survey results, assuming that a rapid transit system would be built. This modal data was used to arrive at an auto driver work trip origin and destination matrix.

Specifically, 75 percent of the work trips to the control area from districts served by the proposed rapid transit line were assigned to the transit line. This very high level of transit modal split has been achieved in Toronto. It is considered to be an upper limit on the modal split attainable in most North American cities.

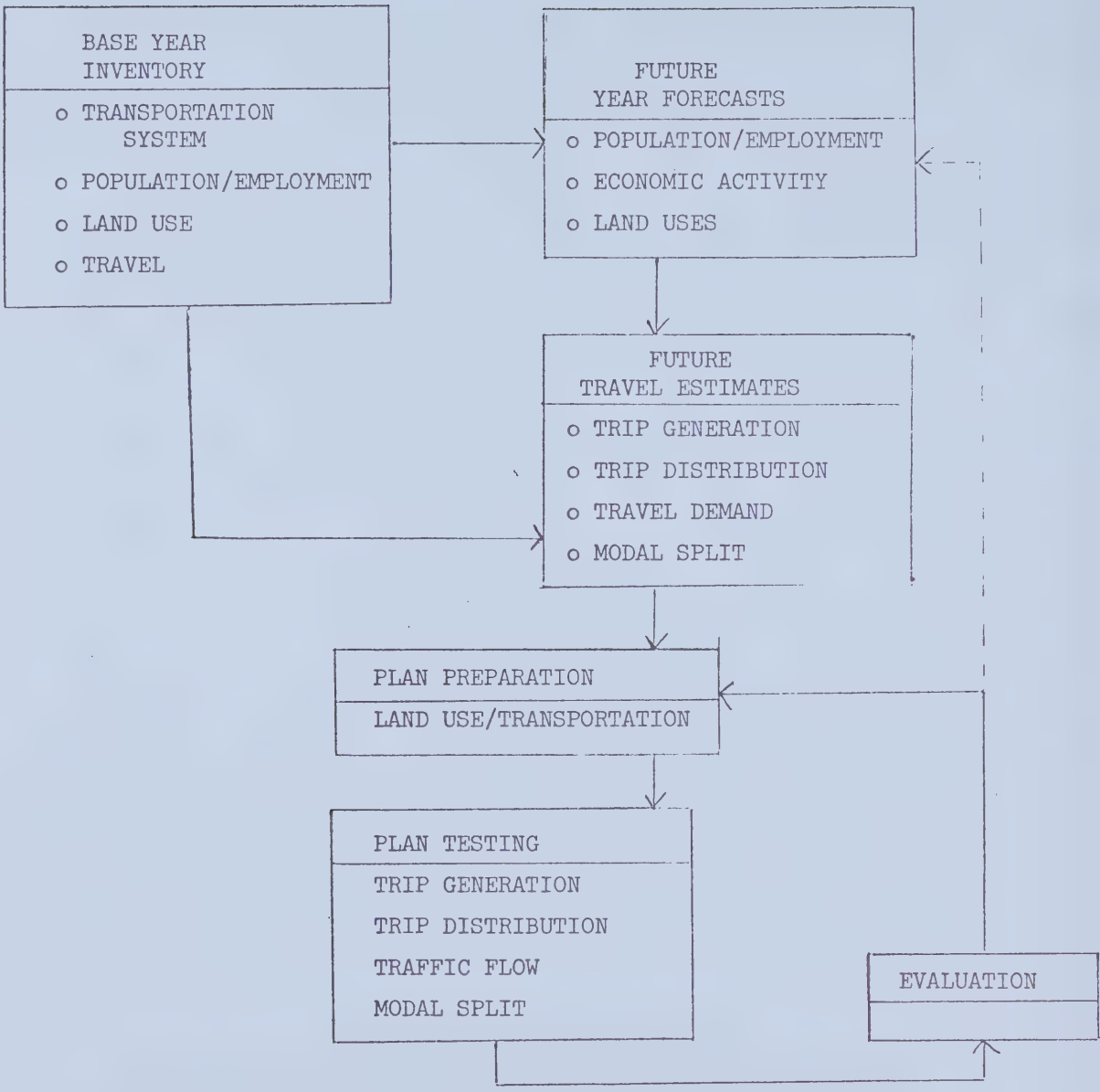


Figure 1. TRANSPORTATION PLANNING PROCESS

Over the City as a whole, the percent of total work trips allocated to transit was increased from 18 percent at present to 24 percent. This is a substantial increase of 33 percent over the existing level of transit usage.

The inter-zonal auto driver work trip data was then loaded onto a corridor network based on the Position Paper transportation system. Each link in the network represents a combination of streets which are parallel or close to a corridor. Trips were assigned to the network by a stochastic loading technique which placed the trips between each pair of zones on a number of the quickest (based on a travel time parameter) routes between the zones. However, this assignment only showed for each link in the road system the A.M. peak hour volume for the work trips only. To arrive at the total auto driver vehicle trips on the roadway, it was assumed by the study team that for the A.M. peak hour, work trips made up 85 percent of the total trips.

(d) Plan Preparation

The general major street network of the Position Paper was used in the assignments. Adjustments were made to have one assignment with the proposed Outer Ring and one without,and were made to a corridor type network. Generally this indicates that each corridor represents a number of facilities available within it to accommodate traffic. Thus, in the interpretation of the assignment, recognition must be given to the composition of the corridor. Actually, in the Edmonton case, some of the corridors are single facilities because of the road system discontinuities at the river. In this case, it is not possible to divert traffic to other facilities because they do not cross the river.

Subsequently, in the discussion on traffic volumes it will be shown that the volumes on the Inner Ring Road are quite substantial, and diversion to other streets in the corridor not possible. Thus, it is expected that because of the capacity restraint in effect at the river crossings, some traffic will be diverted to the Outer Ring.

Summary

The traffic volumes assigned to the two test networks were representative of the A.M. peak hour, auto driver trips. The volumes incl-ded internal as well as external components. The external traffic was a small percentage of the total traffic assigned. The external traffic did include truck trips but compared to the possible volume of internal truck trips, this was insignificant.

Traffic Volumes

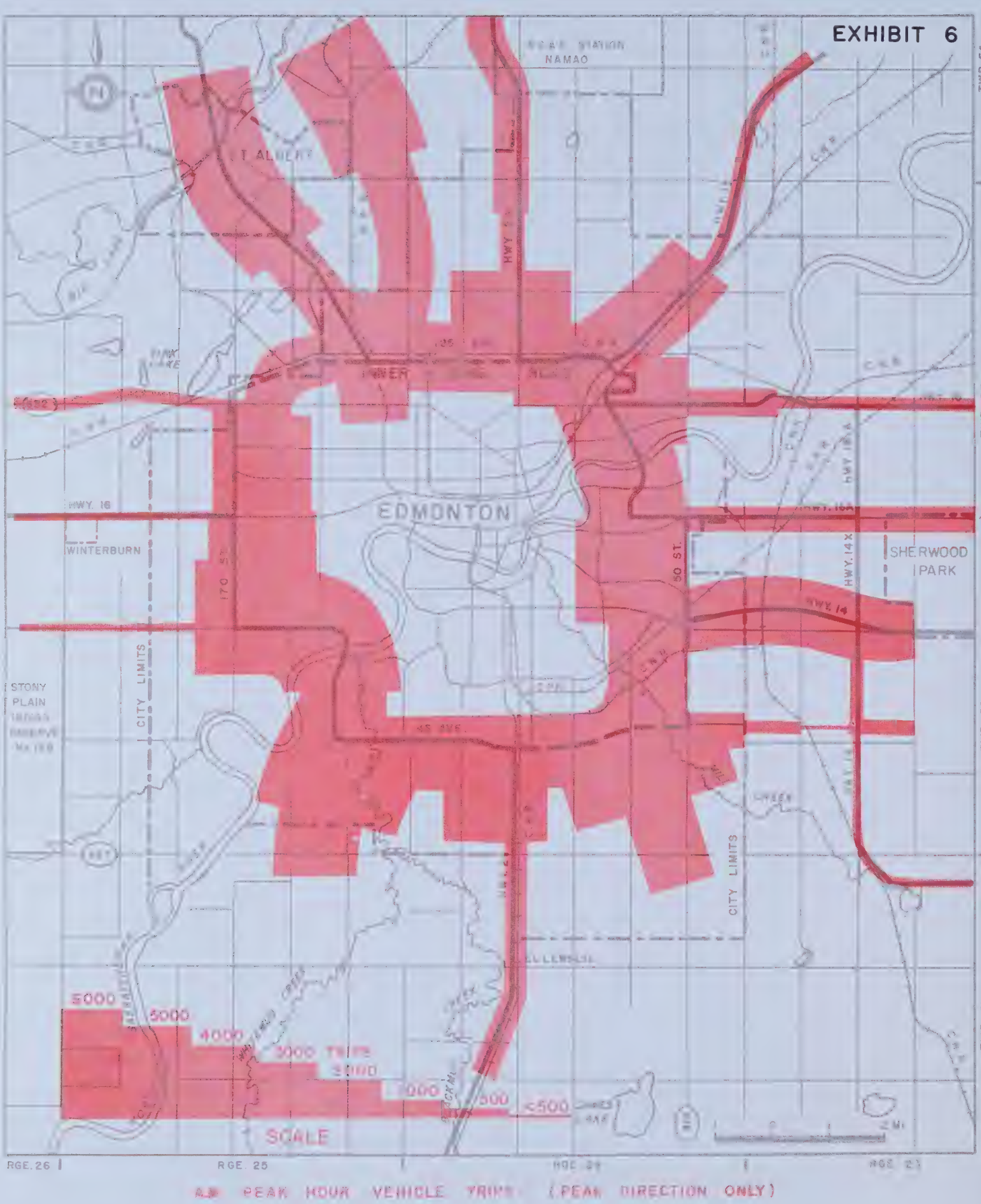
The A.M. peak hour traffic volumes described in the previous section were assigned to two road networks, one with the outer parkway ring as part of the road network and a second network without the outer parkway ring.

The auto traffic volumes assigned to the two networks were traffic volumes after the transit trips had been split off. As was discussed previously, a very optimistic, but achievable, modal split to transit in the rapid transit corridors was employed. The resulting auto traffic volumes assigned to the network are then conservative, in the event such levels of modal split are not attained.

Exhibit 6 shows the A.M. peak hour vehicle trips on the major radial penetrator roads and the inner road but without the outer parkway ring. In the exhibit the inner ring road system consists of 125 Avenue to the north, the Capilano Freeway and 75 Street to the east, 45 Avenue to the south and 170 Street to the west. Exhibit 7 shows the A.M. peak hour vehicle trips assigned to the roadway network with the outer parkway ring as part of the network. In both exhibits only the volume in the heaviest direction of flow is illustrated.

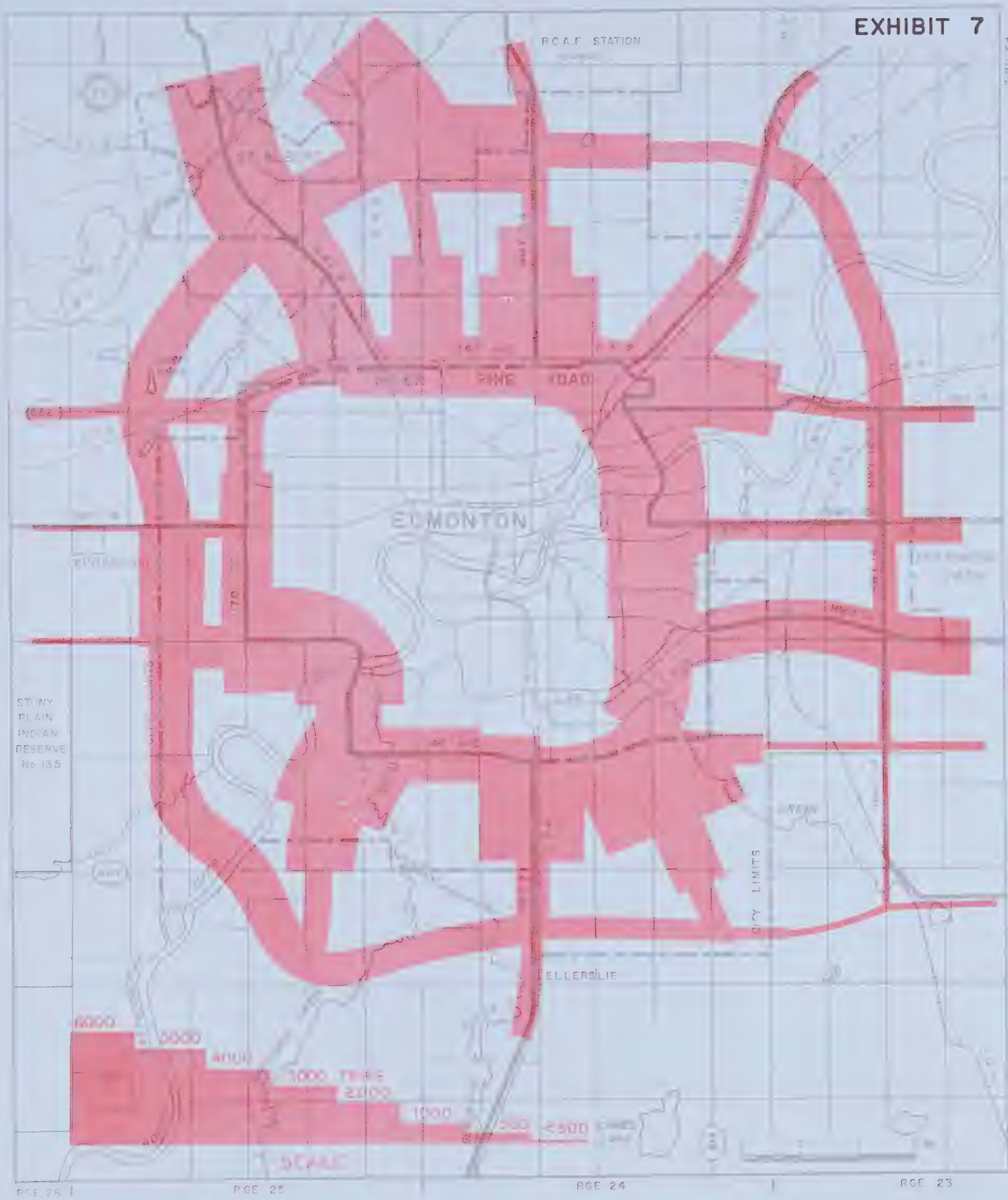
Table 1 indicates the traffic volumes on the outer ring from these assignments.

An analysis of Exhibits 6 and 7 shows that without the outer parkway ring in the system the traffic volumes on the inner ring system will be considerably heavier than if the outer parkway ring were part of the total system, That is, the inner road will attempt to serve partially the function of the outer parkway ring. For example, many of the trips between West Jasper Place and the east industrial development could be made via the outer parkway ring. If the outer parkway ring does not exist these trips will have to be made via the penetrator roads onto the inner ring road system or through the downtown core.



TRAFFIC VOLUMES WITHOUT OUTER RING ROAD

EXHIBIT 7



P.M. PEAK HOUR VEHICLE TRIPS (PEAK DIRECTION ONLY)

TRAFFIC VOLUMES WITH OUTER RING ROAD

Table 1

AM PEAK HOUR AUTO VOLUMES
Population 1,000,000
With Outer Ring *

RING SECTION		AM PEAK HOUR AUTO VOLUME AND DIRECTIONAL SPLIT
From	To	
North Sask. River	Whitemud Freeway	400/2300**
Whitemud Freeway	Stony Plain Rd.	1900/3800
Stony Plain Rd.	118th Avenue	1800/3500
118th Avenue	St. Albert Trail	1100/2200
St. Albert Trail	N.W. Freeway	900/2600
N.W. Freeway	Hwy. #28	900/4600
Hwy. #28	Hwy. #15	600/1050
Hwy. #15	North Sask. River	500/700
North Sask. River	Hwy. #16	200/1550
Hwy. #16	101st Avenue	300/1700
101st Avenue	Hwy. #14	150/950
Hwy. #14	Hwy. #14E.	150/450
Hwy. #14E.	34th Street	150/150
34th Street	91st Street	400/1350
91st Street	111th Street	400/1000
111th Street	North Sask. River	900/1500

* Volumes that will occur at a horizon population of 1,000,000 people.

** 400 = 400 vph in minor direction
2300 = 2300 vph in major direction

The volumes shown do not include truck trips. In many municipalities a common factor is applied to the auto traffic to adjust for truck traffic. This factor is in the order of 10 to 15 percent. Truck trips are especially hard to forecast particularly because of the high percentage of trucks employed in construction. The traffic patterns of these construction vehicles are not easy to forecast as they are transient in nature.

However, a review of Exhibit 7 or Table 1 indicates that substantial volumes of traffic are accommodated on the outer ring, amounting on one section between the N.W. Freeway & Hwy. 28 to approximately 4600 vehicles per hour. If this were adjusted to account for trucks it is likely the volume would approach 5000 vehicles per hour. This corridor volume would require the equivalent of 4 to 5 lanes in one direction to accommodate traffic at Level of Service 'C' or 3 to 4 lanes in one direction to accommodate traffic at Level of Service 'D'. Illustration of the various levels of service are indicated on Exhibits 8 and 9. Most parts of the ring had one-way volumes of 2600 per hour or less. This would indicate approximately 2 to 3 lanes per direction. Only the section between Whitemud Freeway to 118 Avenue (3500 to 3000 autos per hour) and the section between the N.W. Freeway and Hwy. 28 (4600 autos per hour) exceed this.

An examination of the volumes of the ring as shown in Exhibit 7 reveals only a light volume of traffic on the south-east leg of the outer parkway ring. This is due to the nature of the traffic data available for the Study. In all probability if it had been possible to do an assignment of the peak hour during a weekend a much heavier load would occur on this leg. By far the majority of the trips (estimated at 85%) during the A.M. peak hour are of the home to work nature whereas on the weekend peaks the majority of the trips are of a recreational nature.

The traffic volumes around the ring are not at all uniform and reflect the different land development uses and intensities around the

LEVEL A

LEVEL B

LEVEL C

LEVELS OF SERVICE

LEVEL D

LEVEL E

LEVEL F

LEVELS OF SERVICE

ring. This would indicate that implementation of sections of the ring could be delayed until demand is created by land use.

The A.M. peak hour traffic volumes on the Inner Ring Road (when the Outer Ring Road was also in the network) varied considerably. The eastern leg was most heavily used with volumes of approximately 5000 per hour. The western leg was the lightest, possibly due to the proximity of the Outer Ring. The A.M. peak hour volumes on the western, northern and southern legs were generally less than 3000.

When the Outer Ring was removed from the network, the traffic flow pattern in Exhibit 6 resulted. As can be seen when comparing Exhibits 6 and 7, the volumes on the Inner Ring increased substantially. A.M. peak hour volumes of 4000 to 6000 occur on the eastern leg; approximately 4000 on the southern leg; 3000 to 6000 on the western leg and 3000 to 4000 on the northern leg.

The volumes on the penetrator legs approaching the Inner Ring are also larger in Exhibit 6 than shown in Exhibit 7.

Traffic Conclusions

The traffic assignments for the two cases studied, i.e. with and without the outer ring, were crude approximations of peak hour traffic volumes. The limitations of trip purpose and truck trips were recognized. The corridor assignments were considered to be sufficiently accurate for the purposes of this review, i.e. to assess the traffic impact with and without a ring road.

It is not possible to detail the lane requirements of either the inner or outer ring using the information obtained in this review. Besides traffic volume data, additional information is required on weaving, entrances and exits. This is not considered essential at this time. Approximate lane requirements can be obtained by using 1200 autos per hour. This will make allowances for trucks and still give a Level of Service 'C'.

The geometric design standards of the road will have an influence on the number of lanes. It has been assumed that an access-controlled roadway is required. However, the traffic volumes when the City has 1,000,000 population are quite variable over the outer ring.

Similarly it is not possible to estimate a construction schedule of implementation. The areas with the greatest traffic volumes obviously have the greatest need. However, the traffic volumes are a function of economic activity and this is reflected in the servicing and use of the land. The implementation schedule must be developed using as input the extension of essential sewer and water facilities as well as traffic forecasts.

The traffic assignments indicate that the future impact on the areas adjacent to the inner ring, and along some of the penetrator roads would be more severe without the outer Ring Road. The ability of the existing neighbourhoods along the inner ring to accept this impact is certainly less than the ability of the future neighbourhoods adjacent to the proposed outer ring. The outer ring can be designed to lessen or eliminate adverse effects.

The excess of traffic volumes on the penetrators can be lessened when the outer ring is used to more evenly distribute the traffic over the available access routes to the central area. Thus along certain penetrators, major widenings may not be required, because traffic could use the next penetrator. The obvious costs in terms of travel distance are recognized, but travel time costs may not be considered a significant factor.

The outer ring will not directly affect the modal split between transit and auto. The assumed modal split in the traffic analysis recognized certain zones and diverted to transit substantial volumes of commuter traffic. Up to 75 percent of work trips to the central area from zones adjacent to the proposed rapid transit were allocated to transit. This ratio is achieved only in large cities with excellent transit. The outer ring may assist transit in that it will be possible to develop, park and ride lots with express transit connections to the central area. Transit is generally downtown-focussed because that is where the heaviest concentration of workers are. However, with the peripheral industrial areas, some "belt line" type transit service could be offered. It is doubtful that transit could compete for this type of trip as there is usually little congestion and low, if any, parking costs associated with suburban work locations.

Outlying communities will be able to use the outer ring and avoid travel on the busy penetrators, the inner ring and even perhaps avoid passing through the city centre. Residents from these communities, St. Albert, Sherwood Park and other outlying areas would be able to travel to some of the major industrial and recreational areas without having to add to the volumes on streets within the ring.

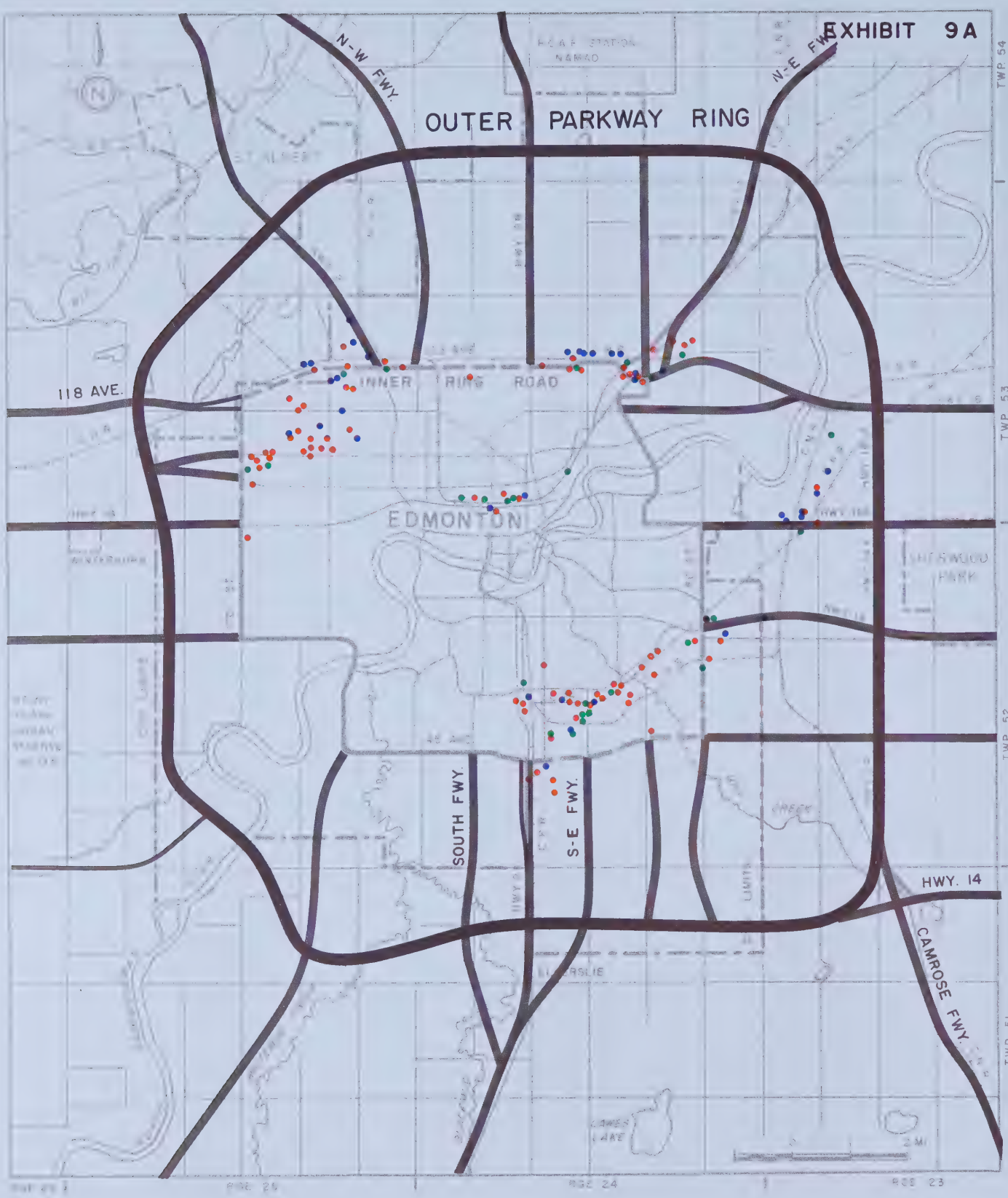
Truck traffic would be encouraged to use an outer ring. Lower operating costs are no doubt a factor influencing this choice. The trucks would not have to enter the city street system until they exited from the ring onto the most direct penetrator serving their destination.

Downtown trucking terminals could be encouraged to relocate adjacent to the ring road provided attractive areas were zoned for that use. Benefits to the central area from a development such as this would be significant. First, large line haul trucks would not have to go into the City to reach a terminal. Secondly, at the truck terminals, the goods could be broken down into smaller truck units. These smaller trucks would have less impact on the neighborhoods along the penetrators and on the traffic stream. The truck traffic serving the industrial areas adjacent to the ring would be substantially assisted. It can be seen in Exhibit 9A that there is a tendency for major truck terminals to locate at the outskirts of the City and near to primary transportation routes.

Land Use Considerations

With regard to residential use, the City already plans to grow in a perimeter fashion, not in the direction of certain major arterials. Thus,residential land use plans are consistent with the concept of a ring road and will tend to be reinforced by a ring road system. In the matter of commercial land use plans, the ring road could have a substantial impact in re-directing commercial growth--and particularly regional shopping centres--to ring road-arterial road intersections. Industrial land use plans in the Edmonton region are not closely related to the development of a ring road complex and there is some likelihood that industrial development in the vicinity of the ring road would develop at the expense of industrial development in other areas of the City. The existence of a ring road with significantly large buffer areas permissive of recreational use would influence the direction of park and recreational development in the Edmonton region. A ring road would also be likely to have an important impact on the location of regional parks.

Land use is discussed in greater detail under "Socio-Economic Impact".



TRUCK TERMINAL LOCATIONS

Multiple Use of Corridors

The basic principle of the multiple use corridor concept is the joint utilization of right-of-way for a number of purposes. The Ring Road, in addition to serving as a facility to move traffic, has a number of other equally important benefits which can be realized through the multiple use of the corridor. Because environmental buffer zones would be required in a number of areas between the roadway and adjacent developments to shield against noise and/or visual intrusion, the additional right-of-way thus provided could be utilized for various purposes. The width of the buffer zones would depend on the adjoining land use and the design treatment of the roadway. In general terms, more right-of-way would be required in the vicinity of residential development than in commercial or industrial development.

There is a demand for additional rights-of-way for major utility corridors in the Edmonton Area. The major utilities, such as power, water, gas and oil pipelines may individually require wide rights-of way. With proper coordination, the land used for utilities could ideally be integrated into the multiple use of the roadway buffers.

The center median of the Ring Road will be adequate in width to accommodate other modes of transportation. At the same time, parking areas could be provided at intervals along the corridor in conjunction with possible bus or rapid transit service to the downtown area.

Perhaps one of the most important considerations of the multiple-use concept would be parks and recreation. It has been indicated by the Department of Lands and Forests, Parks Division, that there is no inherent demand pressure for recreation facilities to be located great distances from places of residence. However, the demand for recreation is there, and such development should be focused on serving the demand at or near its source. The trend now is to locate and develop the recreation areas where the people are, i.e., near the major Metropolitan Areas. When considered in light of the multiple-use concept,

EXHIBIT 10

MULTIPLE USE CORRIDOR

one of the significant impacts of the Ring Road would probably be the impetus it would create for regional parks in the Edmonton region periphery. An opportunity would be presented to tie the existing City Parks to provincial and regional recreation systems beyond the Ring Road. It can be concluded that the direction, the nature and the scope of parks and recreation planning in the region will be significantly influenced by the Ring Road and the Multiple-Use Concept.

Some other uses which may be considered for the multiple use of right-of-way are industrial, commercial or institutional developments, conservation areas, preserves and trail systems. Careful planning and research would have to be carried out to ensure the practicality of various combinations of uses. During the planning stages all concerned Government Departments as well as the City and adjacent municipalities and utility companies should be involved.

Metropolitan Region Considerations

The Regional Rural Road Study which was completed in 1967 indicated that there was a gap between the Regional Roads and those in the Urban Area at the periphery of the City. The Ring Road would provide an efficient means for fulfilling the function of integrating Urban and Regional traffic.

At the outset of this Study, meetings were held with Councils or Committees of Council of all Taxing Authorities in the Study Area. The purpose of the meetings was to receive input from the various jurisdictions with regard to the Ring Road concept. In general, the concept is well supported by all jurisdictions adjacent to the City. There were two main reasons for this support:

1. A significant portion of the population residing in areas outside the corridor work in the City. And thus, the Outer Ring Road is important since it provides a distribution of access to and from the City.
2. Access from rural areas to agricultural markets within the City would be improved.

In discussions with the various Departments of the City of Edmonton there was general agreement with regard to the concept, however, the main questions raised were with regard to the following points:

1. Methods of protecting and acquiring right-of-way in areas within the City Limits.
2. Traffic problems in the downtown core would not be alleviated.

Although discussions were held with a relatively large number of municipal and elected representatives from the various jurisdictions, it is suggested that in the follow-up stages public involvement be initiated to ensure the acceptability of the concept and the location. This should preferably be in the form of an Attitude Survey and/or Selective Public Participation.

Summary

In examining the need for an "Outer Ring Road" in terms of its function, its beneficial impacts on the inner city and the overall transportation system, its impact on urban growth form and land use, and combining all of these with the Multiple-Use Corridor Concept, it becomes quite evident that the Concept should prove to be a real contributor to the well-being of all citizens in the Metropolitan Region. It should be emphasized, however, that the potential success which can be derived depends to a great extent on the degree and means of implementation of the multiple-use considerations for the corridor and its integration with the adjacent land uses.

OPTIMUM LOCATION

OPTIMUM LOCATION

The Outer Ring Road location now under consideration has evolved from the METS Report completed in 1963 and has been further defined by development of community outline plans supplemented by highway route studies. In this Section, the proposed corridor location has been examined in terms of:

- Land Use Controls
- Environmental and Engineering Controls
- Intra-Urban Traffic
- Bridge Spacing

Environmental controls within the corridor are covered in more detail in the following Section - "Environmental Impact Analysis".

Land Use Controls

There are three major physical controls, the Town of St. Albert on the northwest, Namao Airport to the north, and Sherwood Park to the east. These developments restrict the Ring Road from being located farther out than presently proposed, and the next best alternative would be to place the Ring Road beyond them. However, a location so far removed from the populated areas, could not relate to the needs of the planned City growth for the foreseeable future.

Throughout the majority of the Study Area the Ring Road is an integral part of the proposed development as planned by the City of Edmonton Planning and Engineering Departments. Outline plan areas have been developed on the premise that their external boundaries would be skirted by a transportation facility. They are designed to essentially be self-contained units and actual development is taking place to this effect at the present time. When linked together, the natural boundaries of the outline plan areas form the basis for the ring road corridor alignment. Exhibit 11 illustrates land use in the metropolitan area.

Following is a brief summary of controls for the various sections of the corridor. In some instances the controls given are related to alignment within the corridor.

Environmental and Engineering Controls

1. East Leg

- follows existing highway corridor
- good angle of crossings of the CNR lines
- avoids conflict with Calgary Power towers and sub-stations

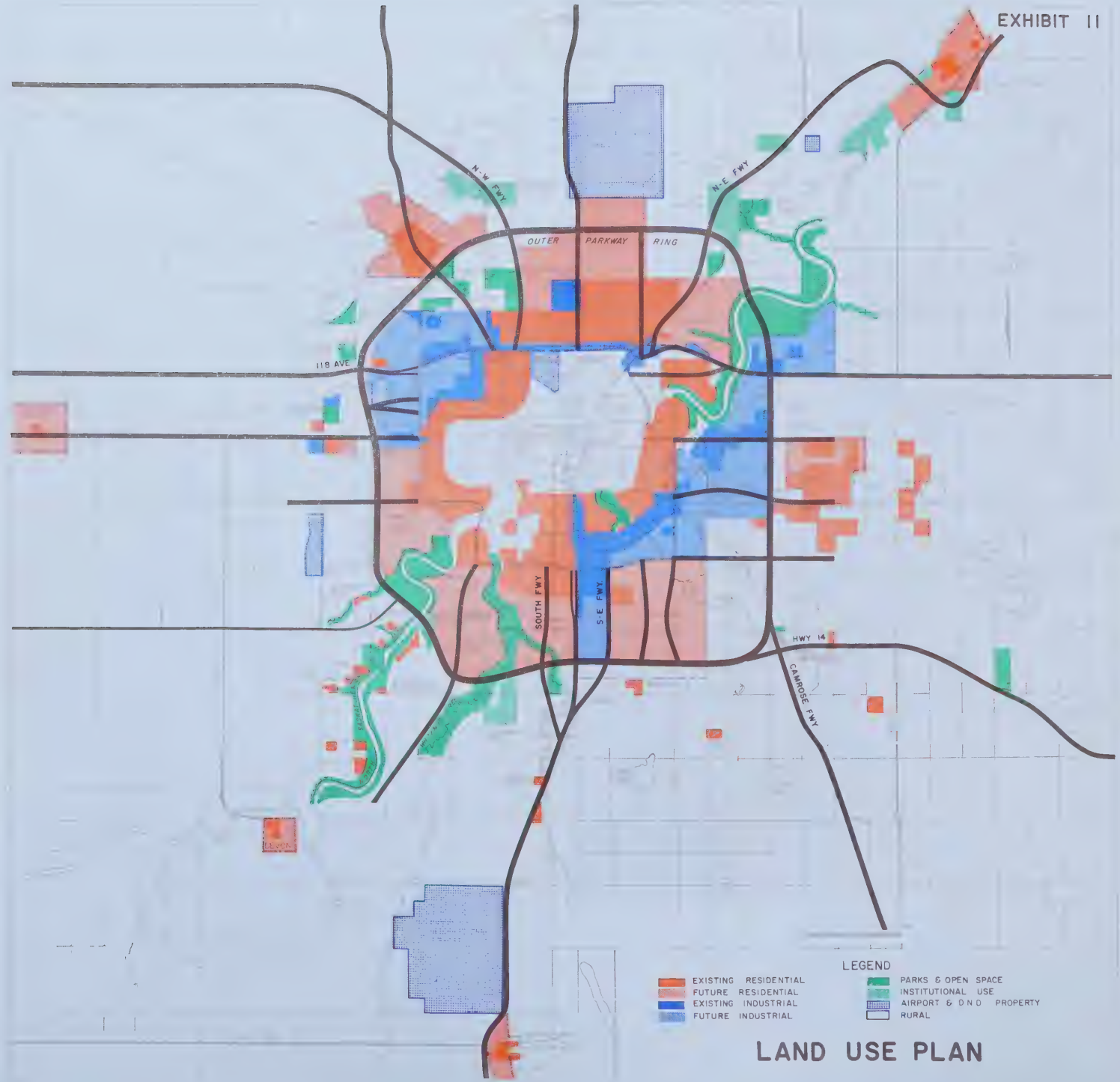
2. South Leg - Highway 2 to Bretona

- lines up with Highway 14 to the East
- compatible with South Boundary of outline plans for Mill Woods and south industrial area
- provides directness for Ring travel
- location optimal for servicing Mill Woods and industry
- avoids conflict with Wernerville and Ellerslie
- crosses C.P.R. property at high profile point of possible humpyard
- allows for most economical interconnection with Highway 2 South

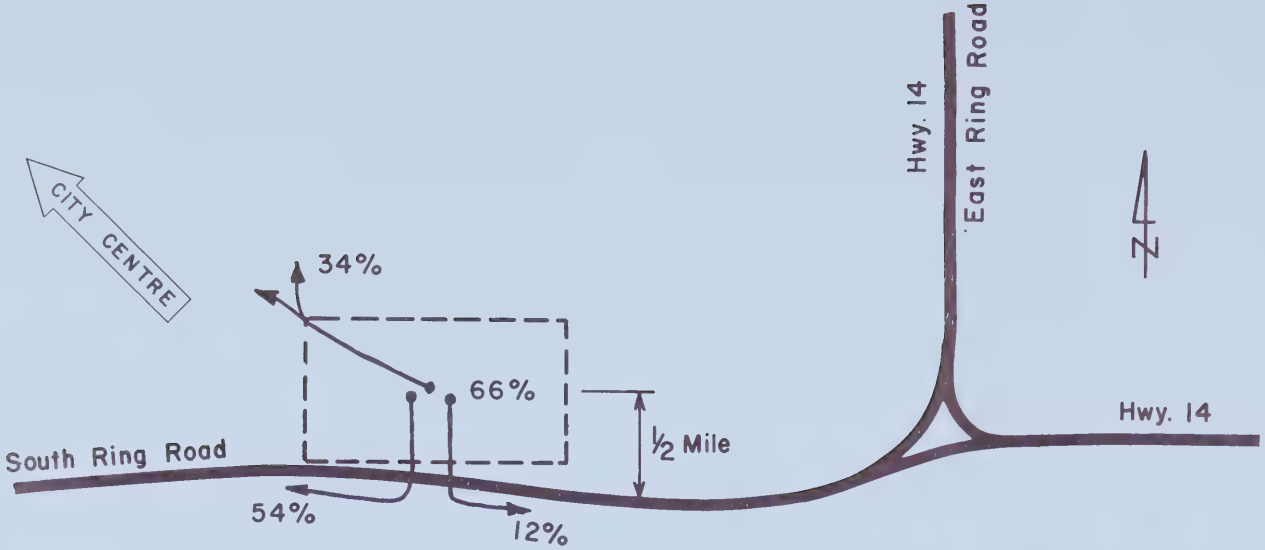
3. South Leg - Highway 2 to North Saskatchewan River Crossing

- compatible with South boundary of outline plans for Kaskitayo and Terwillegar Heights
- perpendicular crossings of Whitemud and Blackmud minimizes adverse environmental impact
- avoids serious conflict with U. of A. Ellerslie Agricultural Research Station
- most economical river bridge location
- reasonable buffer maintained between route and development
- avoids severance and conflict with potential and existing recreational development
- provides reasonable bridge spacing for cross-river movements of traffic.

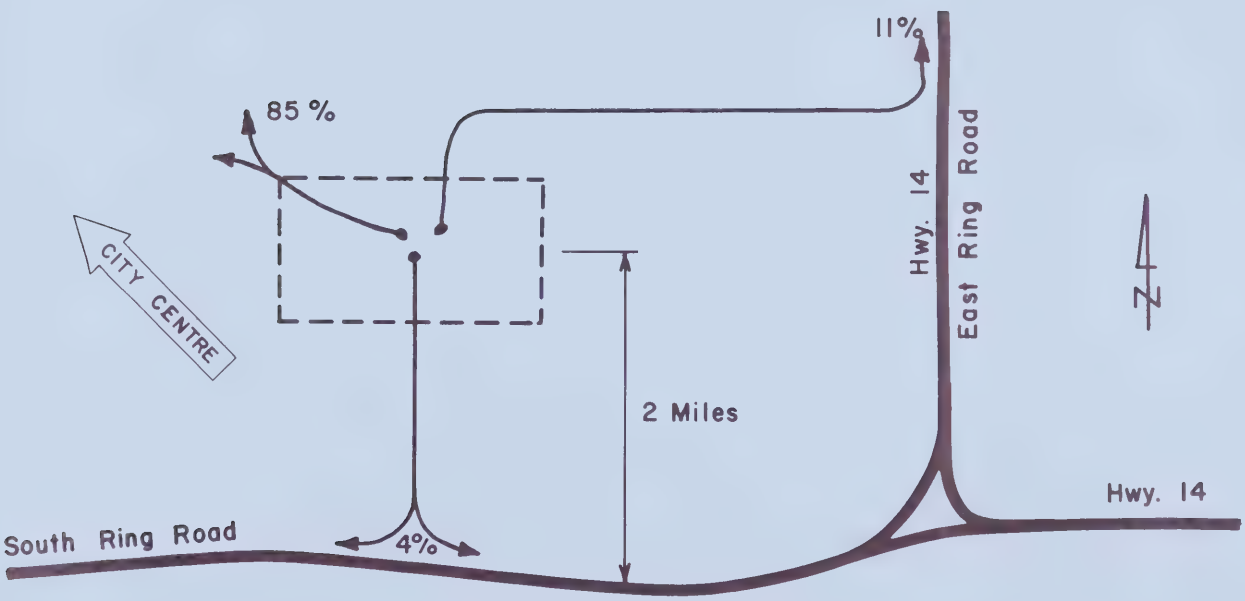
EXHIBIT II



LAND USE PLAN



NEIGHBOURHOOD CENTRED 1/2 MILE FROM RING ROAD



NEIGHBOURHOOD CENTRED 2 MILES FROM RING ROAD

TRAFFIC SIMULATION MODELS

4. West Leg - North Saskatchewan River Crossing to Highway 16

- compatible with West boundary of outline plan for West Jasper Place
- intersection with Highway 16 dictated by development and Winterburn Interchange
- perpendicular crossing of Wedgewood Ravine minimizes adverse environmental impact
- choice location for providing access to the potential Big Island Recreational Area

5. West Leg - Highway 16 to Highway 2

- route shifted west to avoid adverse effects on Mooncrest Subdivision and Kirk Lake
- route located to avoid conflict with Glendale Golf and Country Club and Golden West Golf Course
- intersection with Highway 2 restricted to a point between Jasper Auto Parts and St. Joseph's Seminary

6. North Leg - Highway 2 to North Saskatchewan River Crossing

- compatible with South boundary of subdivision plans of St. Albert
- route located to provide good access to site of Athabasca University
- good angle of crossings of N.A.R. and C.N.R. Lines
- intersection of Highway 28 dictated by spacing requirements relative to the Namao Airport Interchange
- intersection with Highway 15 dictated by interchange spacing requirements of Highway 15 route extending into the City
- minimizes conflict with Oliver Hospital lands and development
- compatible with outline plan for Clareview

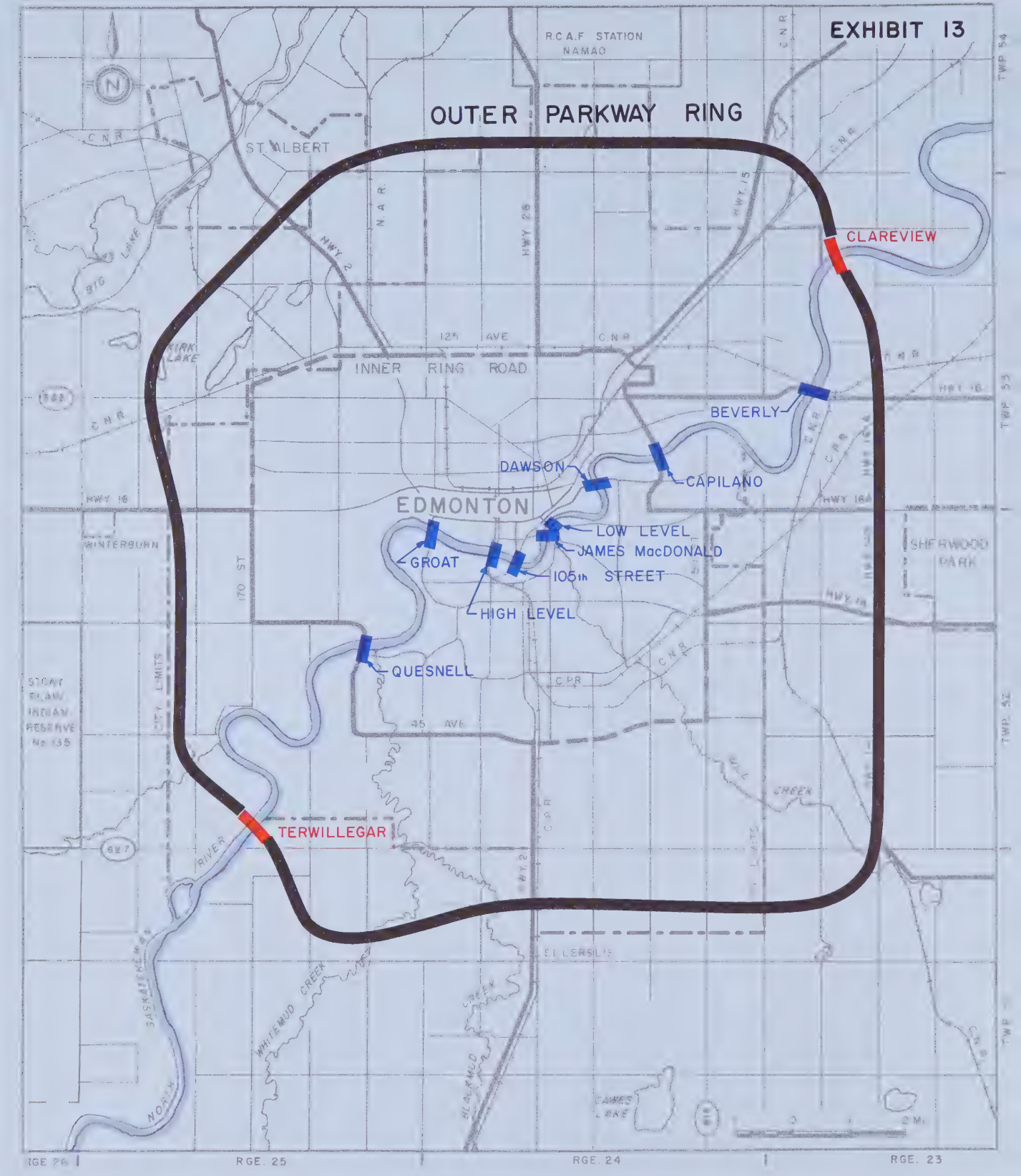
Intra-Urban Traffic

The major function of the Ring Road would be to initially accommodate intra-urban traffic. Therefore, its usefulness and realizable benefit is dependent on its nearness to the trip origins and destinations. In the case of Edmonton this implies that the closer in the roadway, the higher would be its usage, and consequently the greater the reduction of traffic on major arterials in the inner city. Conversely, the farther away it is from development, the lesser will be its utility based on the present outline plans. The latter situation is evident in the case of the Ring Road in Winnipeg, where traffic volumes are very low because of the considerable distance from development. This does not say, however, that a location farther out would be wrong, but it implies that benefits from it would not be realized until equivalent development reached the corridor.

The relative usefulness of the Ring Road for trips from inside the Ring is illustrated by the two traffic simulation models for Mill Woods. For a neighbourhood centred one-half mile from the proposed ring road 66% of drivers would typically use the Ring Road. For a neighbourhood centred two miles from the proposed Ring Road utilization drops to 15%. (See Exhibit 12)

Bridge Spacing

Exhibit 13 indicates existing bridge crossings of the North Saskatchewan River. A number of alternative bridge locations for the northeast and southwest river crossings have been examined by the Department of Highways and Transport. Shifting the river crossings for the Ring Road significantly farther out would result in overloading of the nearest bridges, and probably require supplementary river crossings. In general, the bridge spacing for the proposed Ring Road location is reasonable, however a number of other factors have to be considered in the final evaluation.



RIVER CROSSING SITES

LOOKING SOUTHWEST

LOOKING EAST

SOUTHWEST RIVER CROSSING

Exhibit 14 illustrates the recommended location for the southwest river crossing. The photos are of a scale model of the crossing which had been previously constructed for the Department of Highways and Transport. The model portrays the major topographical features, terrain and development in the general area of the proposed crossing, and the integration of the bridge with these features. The proposed location is optimal in terms of impact on physical features in this area and in terms of distance from the next nearest river crossings.

Summary

The location of the Ring Road Corridor is well defined by existing development adjacent to the City, significant physical controls and the Outline Plan Areas. There are also a number of important engineering and environmental considerations which further delimit the location. Above all, there is the consideration that the Ring Road should be located close to the developed areas or it will lose its attractiveness to the urban dweller. It can be concluded that in terms of the controls discussed the proposed corridor is at its optimum location.

ENVIRONMENTAL IMPACT ANALYSIS

ENVIRONMENTAL IMPACT ANALYSIS

An environmental analysis has been carried out for the recommended location of the Ring Road Corridor and the results are presented in this Section.

Elements which have been analysed fall into three basic categories:

Natural Environment
Man-Made Environment
Transportation Engineering

In the case of Natural Environment the examination has considered the potential impacts of the proposed Ring Road Corridor on soil, vegetation, wildlife, surface water, water quality and landscape absorption.

Socio-Economic issues are the concern in the case of the Man-Made Environment, exemplified by impacts on existing and proposed land uses, and noise and air pollution.

Transportation Engineering involves elements such as susceptibility to snowdrifting, staging considerations, utilities and costs.

Many of the items are not quantifiable and, therefore, extensive use has been made of a mapping technique to provide a visual illustration of the impacts. The exhibits have one characteristic in common: The darker the tone the more significant is the control exercised by the item.

Soil Material

The soils in the vicinity of the Ring Road are generally well drained except for isolated swampy areas. Erosion will not be a serious problem and proper management techniques such as seeding and sodding will maintain the soils. Exhibit 15 indicates that the proposed location crosses several small swamps, mainly on the west, with generally shallow organic deposits. No significant problems are anticipated during construction.

Conclusion

The impact is not significant.

EXHIBIT 15

ORGANIC SOILS & MARSH

UNCLASSIFIED – Rough broken land adjacentant to watercourses

SILTY CLAY LOAM & SILT LOAM

LOAM & SANDY LOAM

SOIL MATERIALS

Vegetation

Exhibit 16 illustrates areas having deciduous and coniferous tree cover. Most of the corridor is located in open farmland and/or low shrub-covered topography. Coniferous trees occur in small clumps generally scattered through the corridor with more significant stands in the river valleys and ravines. Due to the longer growing period and their aesthetic value the coniferous trees are considerably more valuable than other types of tree cover.

In the stages of defining final alignments, consideration should be given to avoiding the more significant stands of coniferous trees. The physical design of the roadway through ravines should preserve tree cover for recreational and aesthetic purposes.

Conclusion

The impact on vegetation is minimal.

EXHIBIT 16

VEGETATION

Wildlife

The ability of land to produce and support wildlife is largely determined by the soil type (and hence vegetation growth) and by the activities of man. Remote areas of good soil or marsh land will be most productive for wildlife, and poor land or urban areas will have fewer species and smaller numbers of animals.

The proposed Ring Road is relatively remote from present habitation except for the east side and the northwest corner. However, future growth of Edmonton is expected to press near to the Ring in most areas and thus the area on the inside of the Ring will not support a large wildlife population in the future regardless of land quality. Outside the Ring and perhaps within the road corridor a wildlife habitat may be maintained, especially if preserves or parks are incorporated into the plan, and if these preserves are of sufficient size. This will be especially possible if preserves and parks of sufficient size are incorporated into the plan.

The impact of a road per se upon wildlife populations is not likely to be great. Urban growth, however, will remove many acres of land from production and therefore reduce wildlife populations. Insofar as a Ring Road contributes to future urban sprawl and suburban industrial developments it will have a much larger impact than is apparent from the few thousand acres actually required for the facility. Insofar as a Ring Road is developed to maintain a viable inner city and to reduce urban sprawl it will have a minimizing effect upon land requirements.

As in the case of agricultural land absorbed by a highway development, it is difficult to place the land requirements in perspective. Monitoring of land capability such as the Canada Land Inventory, from which the present figures were obtained, should be maintained in order that the areas of valuable land remaining are known. Breeding grounds and staging areas for water fowl may be of provincial, and even international, significance, and the fact that hunting in Strathcona County is illegal, and in Parkland is restricted, should not be an argument for lack of land protection.

EXHIBIT 17

SIGNIFICANT WATERFOWL AREAS

INSIGNIFICANT WATERFOWL AREAS

WATERFOWL LAND CAPABILITY

In the northwest and southeast areas steps should be taken to avoid extensive drainage of areas having wildlife capability. With the exception of the Big Lake area near St. Albert and the southeast area of the proposed corridor, the land is mainly classified as having moderate to severe limitations for waterfowl production. Most of the land is classified as having moderately high to very high potential for ungulate (hooved animal) production. Thus, as City growth continues outward, ungulate populations will be pressed back. Strategically placed park areas outside the city area could maintain a certain population of deer, elk, moose or other ungulates.

Conclusion

The direct impact of a Ring Road on wildlife populations, especially those of economically valuable waterfowl and ungulate species, will not be great. Continued urban development, however, will remove considerable productive land. It is difficult to place this land loss in a province-wide perspective or assign it directly to a ring road corridor.

Water

Exhibits 18 and 19 show respectively the water courses, drainage basins, sloughs and poorly drained areas. The North Saskatchewan River is the major water feature in the area. The study area is drained by a series of small creeks flowing down to the North Saskatchewan River.

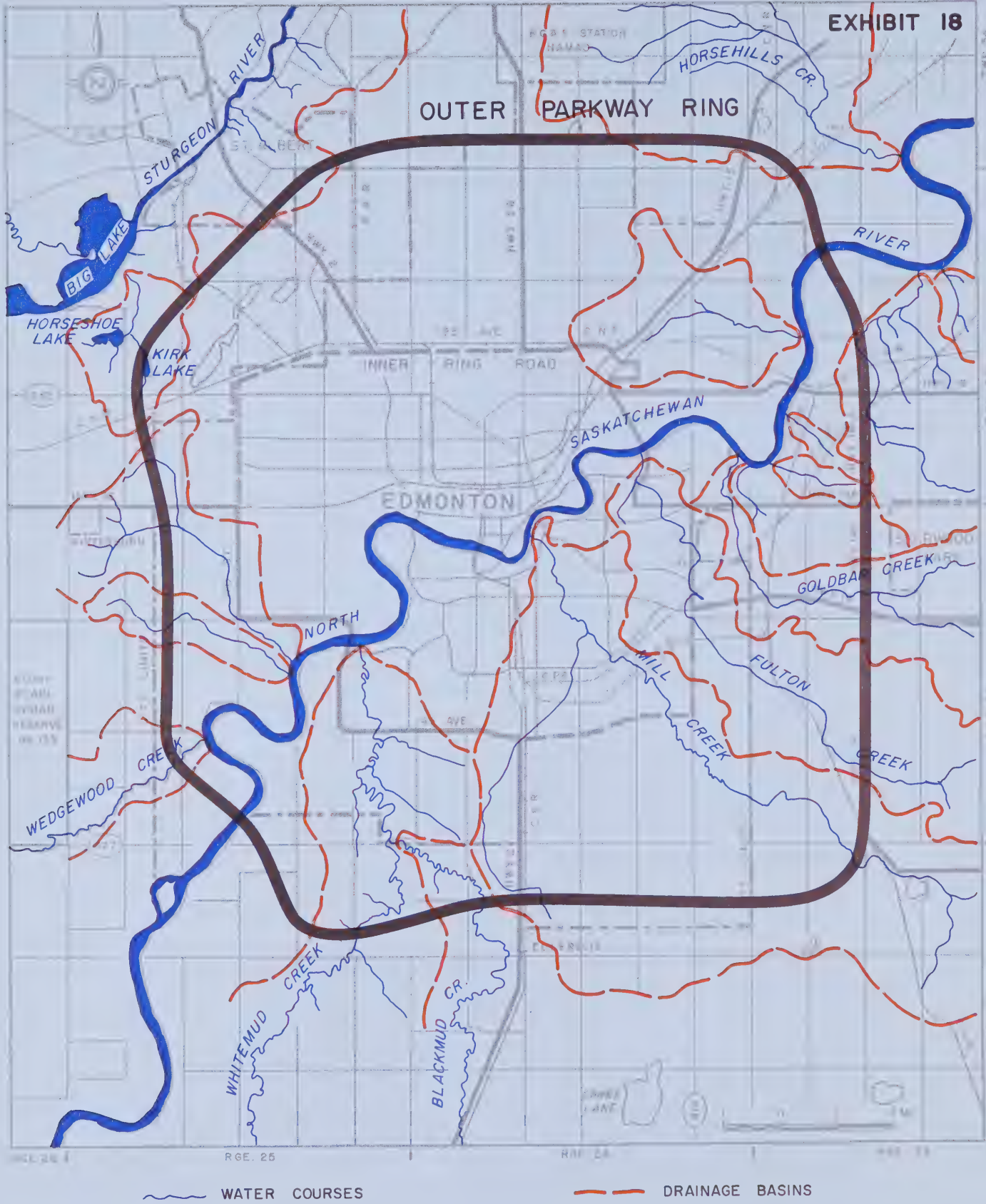
Studies of the North Saskatchewan River, Sturgeon River and Whitemud and Blackmud Creeks show that the water quality is very low throughout the region. The small watersheds are all located in flat areas of very impermeable surficial materials. The hydrology of these watersheds is such that there is a very high peak of runoff in the spring during snowmelt. During the summer, precipitation is mostly absorbed by the landscape through infiltration, ponding in sloughs and evaporation. The flows in the small creeks become intermittent. Because of these factors, the fish populations are restricted to those types which can survive in warm waters of poor quality. The sloughs, where water collects, make ideal habitats for waterfowl.

Any road through this type of hydrologic environment will have little impact on the present water conditions. In the future, it is likely that the water will further deteriorate in terms of quality and quantity as urbanization occurs in the rural watersheds, but the road itself will cause little impact.

After discussions with the Department of the Environment, it was concluded that groundwater would not be a constraining environmental factor in this study.

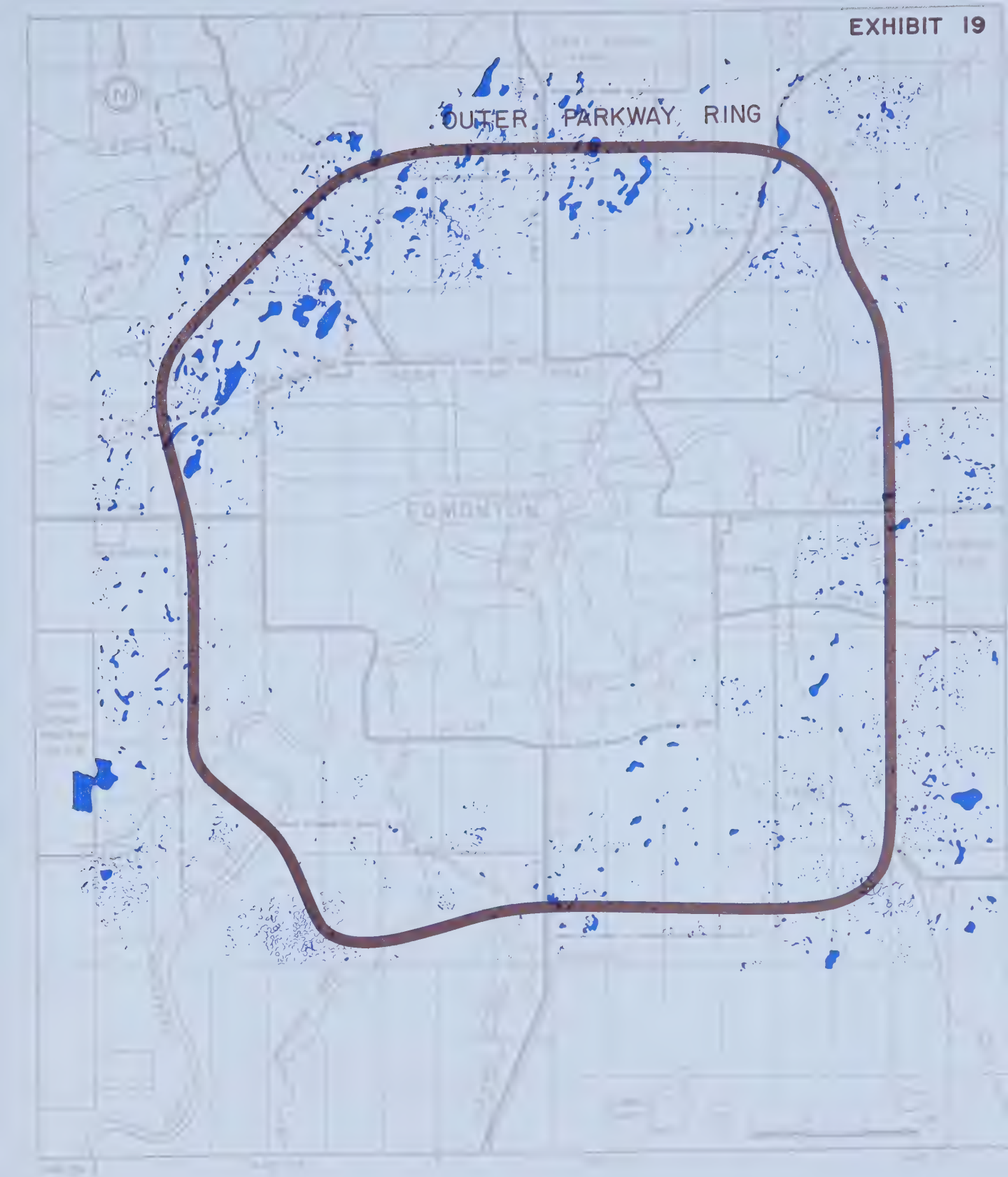
Conclusions

The road will have only a minimum impact on water. There are a few guidelines, however, which should be noted in the final alignment and design:



WATER COURSES AND DRAINAGE BASINS

EXHIBIT 19



SLOUGHS AND AREAS OF POOR SOIL DRAINAGE

- special care should be given to avoid erosion problems at river and creek crossings;
- major sloughs should be avoided in order to preserve them for their wildlife and recreational values, particularly in the northwest;
- as little natural vegetation as possible should be destroyed in order to preserve some of the remaining resilience in the hydrologic cycle;
- Kirk Lake and its associated creek should be avoided if possible;
- in areas of cuts, care will have to be taken to avoid slumping due to water seepage.

Visual Analysis

Visual and aesthetic considerations are an important factor in highway planning and design. Exhibit 20 shows an analysis of the landscape's ability to absorb highway development. This ability to absorb development depends on the nature of the topography and land use. For instance, a high hill is exposed to view over a large land area and therefore has a very low landscape absorption ability. On the other hand, a narrow, steep valley is an enclosed space having a high absorption factor. The Exhibit presents this landscape absorption capacity and is based on the method outlined by Peter Jacobs.(1)

It can be seen in the Exhibit that the exposed landscapes in the study corridor are along the valley of the North Saskatchewan River and on several hills, particularly the one in Terwillegar Heights. The landscapes with a high absorption factor are the small creek valleys and the edge of the Cooking Lake moraine, south of Sherwood Park. The rest of the study area is relatively flat.

This analysis can be used in two ways:

The View of the Road - The critical areas for the road in terms of its intrusion into the landscape are the crossings of the North Saskatchewan River, particularly in the southwest. The ravines, such as Whitemud and Blackmud Creeks, are not very wide and are well vegetated, and crossings of them would have only a localized visual impact. The road borders all of the outline plan areas in very flat landscapes. The implication of this is that the visual impact of the highway would be restricted to the immediately adjacent houses of the developments. The view would be blocked inside this.

The View from the Road - The only outstanding views from the road would be at the crossings of the North Saskatchewan River. For the most part, the road would be crossing very flat terrain. The features which make a highway attractive relate to the sequence of visual experiences encountered. There are few natural features that can be utilized, however, roadside developments and landscaping can provide a pleasing visual sequence.

(1) Peter Jacobs and Douglas Way, 1968, Visual Analysis of Landscape Development (Harvard University)

EXHIBIT 20

LANDSCAPE ABSORPTION

Conclusions

To avoid visual intrustion, special care and treatment in designing the road need to be given in the following locations:

- the exposed crossings of the North Saskatchewan River;
- the crossings of Whitemud and Blackmud Creeks and the Wedgewood Ravine, in order to preserve their important characteristics;
- lands adjacent to the outline plan developments to minimize impact on the housing adjoining the highway.

In order to create a visually attractive road, it is recommended that a curvilinear alignment be adopted and that consideration be given to landscaping the right-of-way so as to produce an interesting visual sequence.

Agricultural Land

Exhibit 21 shows the agricultural capability of the land. Factors considered in the classification are: topography, slope, drainage, presence of sloughs and erosion susceptibility.

The proposed location encroaches on land with predominantly high capability for agricultural use and removes from productivity at least 2000 acres of good agricultural land. This figure would increase if the Multiple-Use Corridor Concept is implemented.

Conclusion

The impact is substantial. However, since the corridor is located in a predominantly agricultural area there is little that can be done to reduce this impact.

EXHIBIT 21

HIGH CAPABILITY (Class 1 & 2)
MODERATE CAPABILITY (Class 3, 4 & 5)
LOW CAPABILITY (Class 6 & 7)

AGRICULTURAL SOIL CAPABILITY

Recreation Areas Affected

Exhibit 22 shows existing and proposed recreation areas and recreation capability or potential. There are no existing or proposed areas which will be traversed by the Ring Road. However, areas with some recreation capability which might be developed in the future will be affected. Specifically, the North Saskatchewan River Valley, Whitemud and Blackmud Ravines and several other ravines that will have to be crossed.

No sites of historical or archeological value were identified within the study corridor.

Conclusions

The roadway will unavoidably intersect the river and will also affect several areas of high recreation capability. It is recommended that special design considerations be given to the crossings of the Whitemud, Blackmud and Wedgewood Ravines in terms of aesthetically pleasing structures which would not impede movement in the ravines. In addition, special consideration should be given to the northeast river crossing to minimize the impact on the recreational capability of the area adjacent to the river.

Regional accessibility to recreation areas will be greatly improved.

The Ring Road Concept and Recreation

During the initial discussions of the Ring Road Concept, several suggestions were made about its possible integration into a regional parks system. Materials on this concept have been prepared by the Edmonton Parks and Recreation Department and the Alberta Department of Lands and Forests, Parks Division. The basic proposition involved is that the Ring Road would require a wide right-of-way to buffer the adjacent land uses. Since this land would be required for the road, could it not also serve as multiple-use recreation lands?

It is not possible to definitively answer this question within the time and scope of this study, but comments on this concept are here included.

The present situation with respect to recreation lands within the Edmonton area is shown in Exhibit 22 and the concept for a regional recreational system utilizing the Ring Road in Exhibit 23. The following are comments regarding these two exhibits.

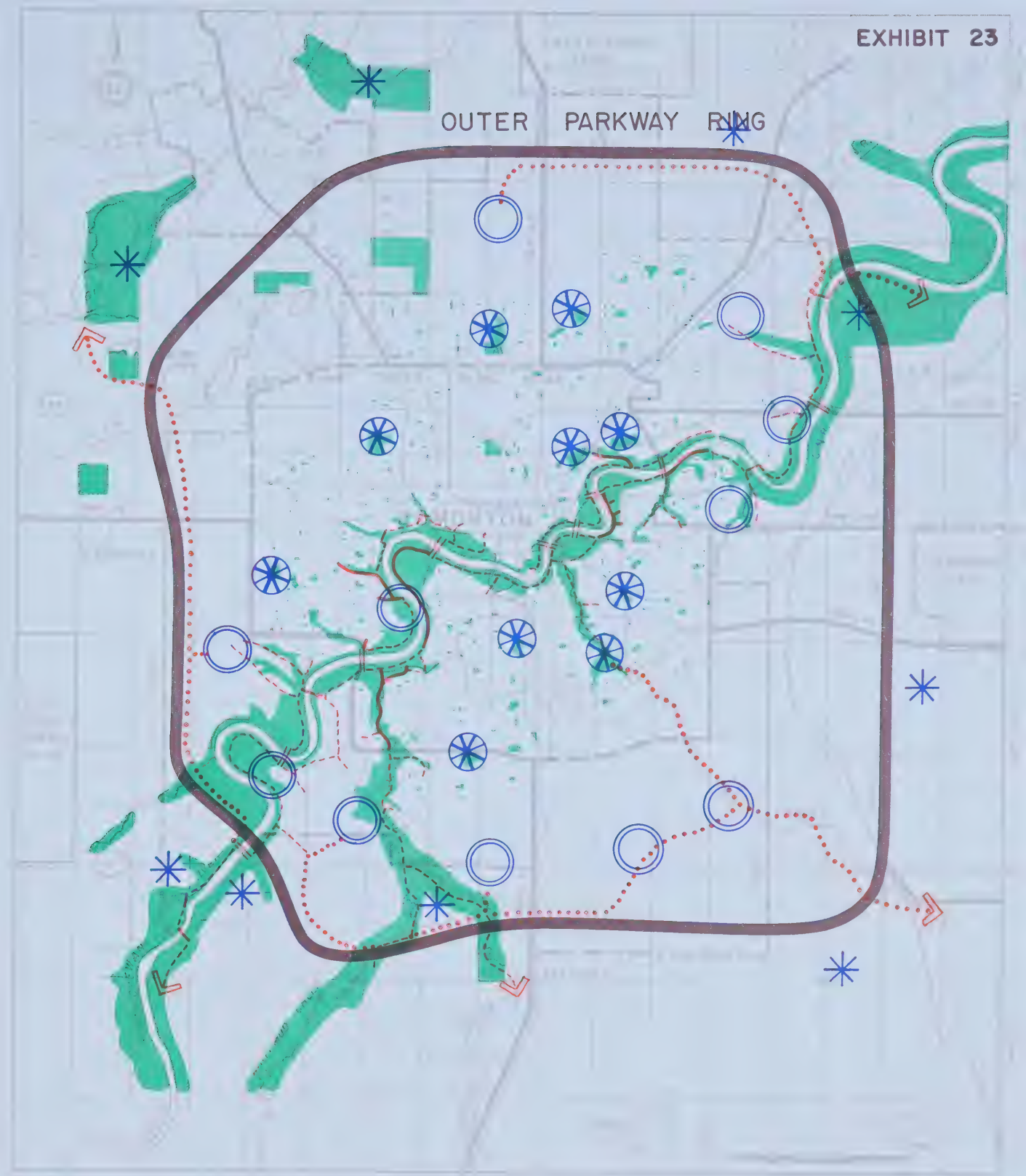
Increasing Leisure Time

More leisure time, larger disposable incomes and a more mobile population will exert an increasing influence on the recreation needs of the people of the City of Edmonton. When combined with a growing population, more recreation space will be required in the Edmonton Area. The new leisure time available to people with the shortening of the work week is creating a different type of demand for recreation facilities. Recent research into how people use the larger "blocks" of leisure time shows a marked increase in the participant-oriented type of recreation activities (fishing, hunting, swimming, travel, boating, hiking, etc.). This will require extensive recreation facilities close to urban centres. The people who are most affected by the increase in leisure time are residents living in the inner and immediate suburbs of the city.

EXHIBIT 22

RECREATION AREAS AND CAPABILITIES

EXHIBIT 23



EXISTING & PROPOSED RECREATIONS AREAS

EXISTING TRAILS

PROPOSED TRAILS IN PARKS & RECREATIONS MASTER PLAN

PROPOSED TRAILS USING BUFFER ZONES OF THE RING ROAD

EXISTING

PROPOSED

COMMUNITY & RECREATION CENTRES

POSSIBLE RECREATION NODES ON CORRIDOR

RECREATION POTENTIAL OF THE RING CORRIDOR

Distribution of Facilities

At the present time, the major recreation facilities in Edmonton are concentrated in a linear corrdidor along the North Saskatchewan River. This distribution gives poor access from many areas of the city and the problem will increase as the city grows in diameter.

The suggestion in Exhibit 23 is that the distribution of facilities could be improved by creating recreation activity nodes around the periphery of the city utilizing the Ring Road to provide access to them.

Recreation Circulation

It is suggested that, in conjunction with the recreation nodes on the periphery of the city, the Ring Road right-of-way could be used to link the nodes together with trails and bike paths. This system would complete and complement other such recreation circulation systems at the neighbourhood and district levels.

Conclusions

The use of the Ring Road right-of-way for recreational purposes would have the following benefits:

- provide additional recreation space;
- improve the distribution of facilities within the city;
- create easy access to recreational activity nodes on the ring and facilities outside it;
- act as a circulation system for recreationalists;
- the corridor could become a recreation facility itself, providing a pleasant driving experience, if developed as a parkway system.

Since buffering around the Ring Road will be required, there is a good opportunity to achieve this. The questions which need to be answered are:

- how much recreational space is needed?
- what are the recreation area opportunities near the Ring Road?

- is the road compatible with the recreation opportunities?
- how wide a right-of-way will be provided?
- are additional expenditures justified to improve the right-of-way to recreation standards?

Air Pollution

Urban air pollution from all sources is coming to be regarded as a significant public health hazard. Motor vehicles typically contribute about one-half of total air pollutants. As truck and automobile use increase, the quality of the air will decrease.

Meteorological data for Edmonton are not yet available to allow prediction or estimation of air pollution in the city air mass from various pollutant sources. Thus, it is impossible to suggest the buffer area required for acceptable dilution of pollutants from a roadway. The larger the buffer, the greater the dilution; however, other factors including frequency of inversions, wind speed, other pollution sources, etc., will influence the pollutant concentration in the air mass.

Conclusion

Air pollution from motor vehicles must not be allowed to increase in the inner city area. Insofar as a Ring Road reduces urban traffic it will help reduce this major source of pollution. If, however, a Ring Road encourages automobile and truck traffic to the inner city it will continue the air quality decline.

Noise Pollution

The City of Edmonton has a by-law which restricts noise to 70 dBA in commercial and industrial areas, 65 dBA in residential areas during the daytime and 50 dBA in residential areas during the night. These noise restrictions are quite close to the noise levels suggested in most areas for the design of major roads. Thus, it is appropriate to use them as a guide in this impact study.

The difference between the 70 dBA level for industrial areas and the 50 dBA for residential is quite substantial - 70 dBA being four times as loud as 50 dBA. A diesel truck travelling at highway speeds emits a noise level of about 92 dBA at the roadway. The land use most sensitive to noise pollution is a quiet residential neighbourhood. Exhibit 24 shows the land uses adjacent to the Ring Road and the most sensitive areas which are demarked by a red band. In these sensitive areas, particular attention will have to be paid to buffering the adjoining land uses from the noise generated by the road in most residential areas where adequate right-of-way is not available.

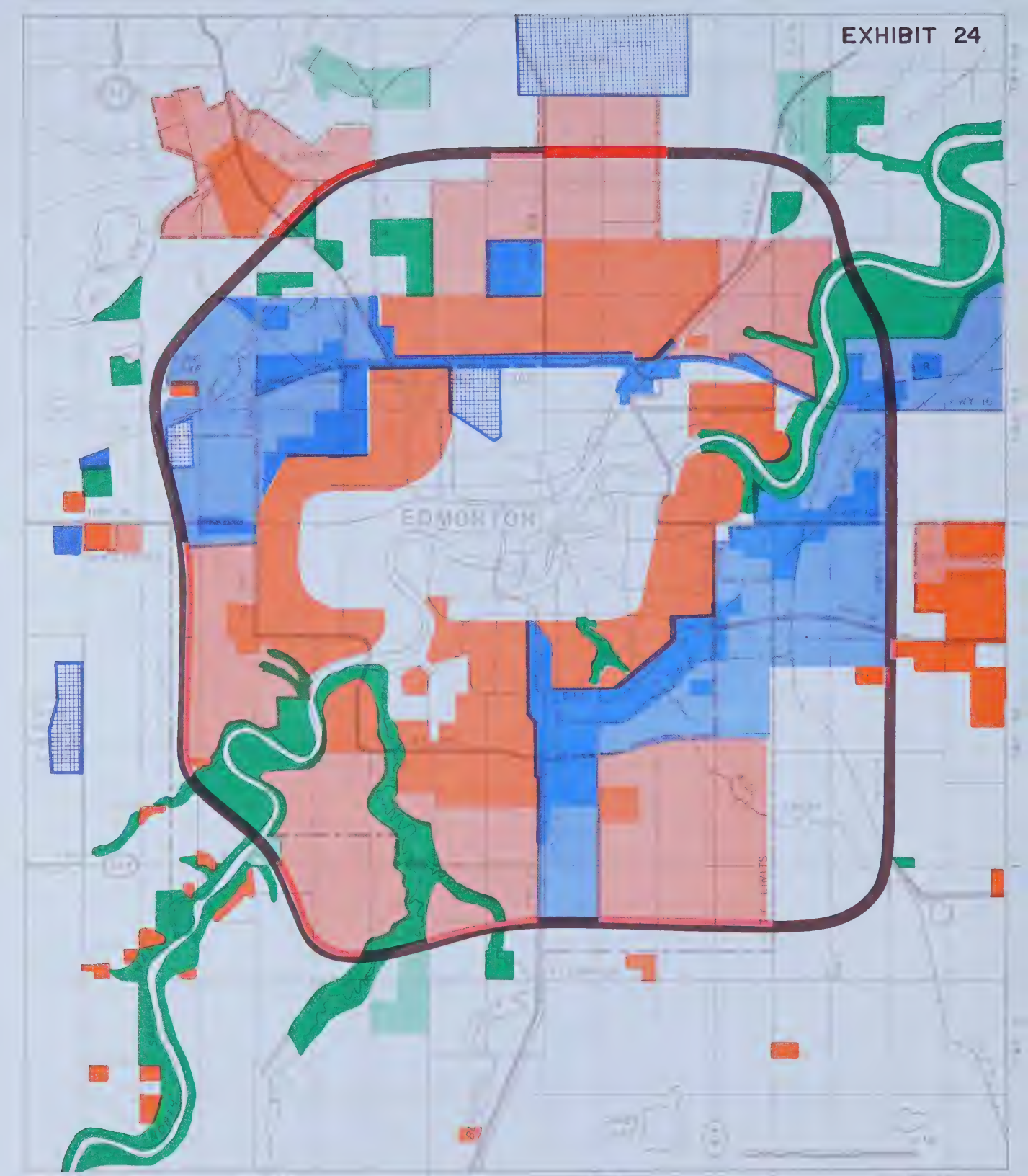
There are a variety of ways such buffering can be achieved involving treatment of the road right-of-way and arrangement of adjoining land uses. Exhibit 25 shows typical methods used in reducing traffic generated sound to levels which are generally acceptable in residential areas.

The most effective reductions in noise level may be attained by depressing the roadway or constructing earth berms, or a combination of both. This can be supplemented by using artificial barriers of dense materials. Noise reductions of lesser degrees (5 to 8 decibels) can be expected by using very wide (100-200 ft.), very dense plantings of trees and shrubs.

Conclusions

The environmental impact of noise requires serious consideration in the location and design of the road, particularly where the more

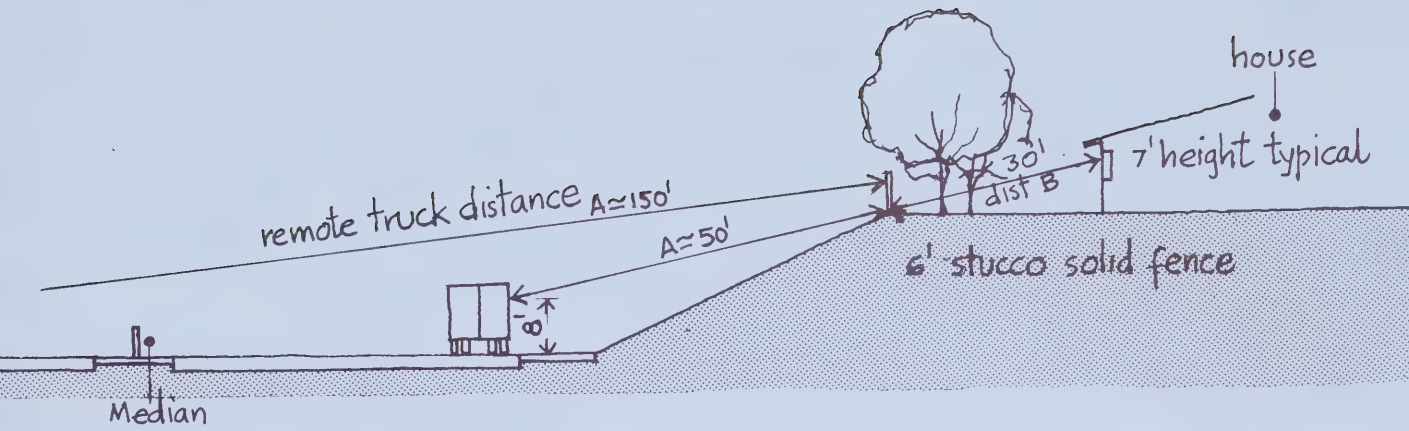
EXHIBIT 24

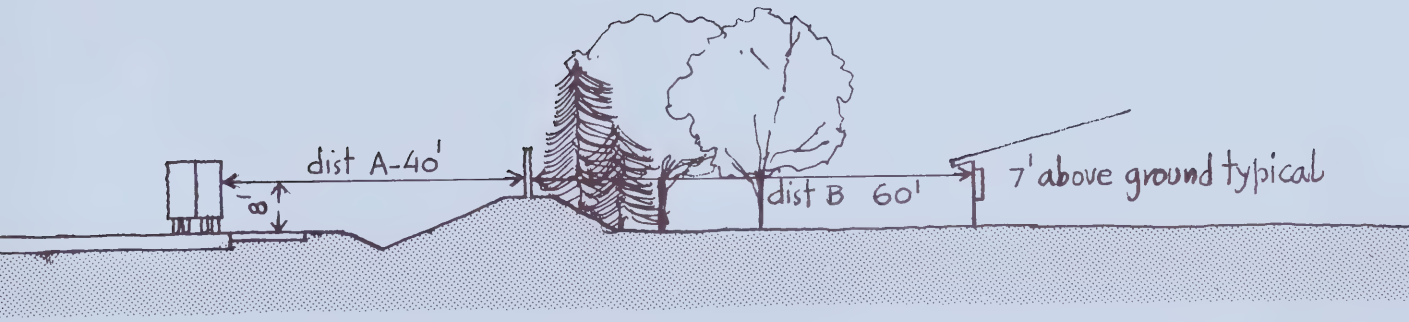


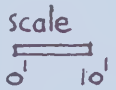
EXIST. & FUT. RESIDENTIAL
EXIST. & FUT. INDUSTRIAL
PARKS & OPEN SPACE
INSTITUTIONAL USE
AIRPORT & D.N.D. PROPERTY
RURAL

SEVERE
LESS SEVERE
NOT A PROBLEM

NOISE POLLUTION







TYPICAL BUFFER TREATMENT

sensitive land uses abut on the right-of-way. This is especially critical in the sections passing next to St. Albert and through the B.A.C.M. development. Here, there are sensitive land uses next to the road and constrained opportunities to buffer against noise.

In areas where adequate right-of-way is available, such as in West Jasper Place, Riverbend, Terwillegar Heights, etc., consideration should be given to protecting additional right-of-way for noise buffering. The wide buffer would be particularly desirable if the multiple use considerations, previously discussed could be employed.

Susceptibility to Snowdrifting

Drifting snow is a serious safety consideration, particularly in "open areas" where the facility is not sheltered by existing vegetation. Drifting snow is always deposited at places where obstacles interfere with the normal passage of the wind.

Various conditions exist depending on the height of embankments:

- There is no deposit on low embankments rising just above the surrounding snow cover. (Exhibit 27-A)
- On high embankments with steep slopes a "vortex" form occurs on top and leads to the formation of mounds. (Exhibit 27-B)
- Similar conditions are present on cuts in the side of hills. (Exhibit 27-C)
- Cuts more than 20' deep are not subject to drifting if there is sufficient room on the sides to accommodate the deposited masses of snow. (Exhibit 27-D)

Natural snowdrift deposits on slopes 8:1 on the windward and 6:1 on the lee side, and therefore deposits do not occur on side-slopes of cuts where the steepness does not exceed these values. This is, of course, the most expensive way of protecting cuts due to the extensive grading quantities and increased right-of-way requirements.

Exhibit 26 indicates that the proposed corridor is located predominantly along wide-open unsheltered agricultural land, and is susceptible to snowdrifting. This problem would have to be given special consideration in the follow-up stages.

Conclusion

The impact is substantial. However, there is little that can be done to reduce this impact in terms of location alternatives. Therefore, the solution to this problem will be limited to appropriate design treatments, as suggested earlier, and/or pre-planting of vegetation within the "environmental buffer zone".

EXHIBIT 26

NO PROTECTION - Open Land

GOOD PROTECTION - Woodland

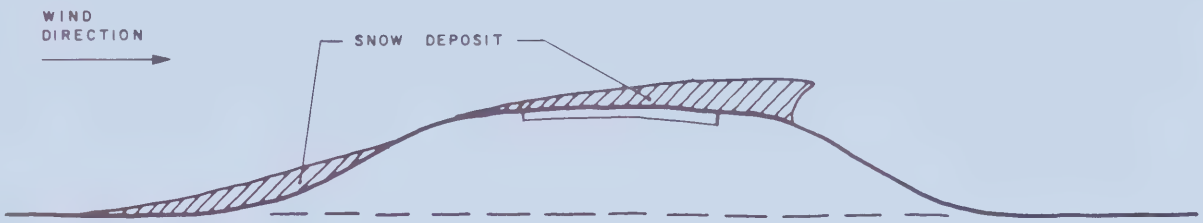
WIND DIRECTION

SUSCEPTIBILITY TO SNOW DRIFTING

EXHIBIT 27

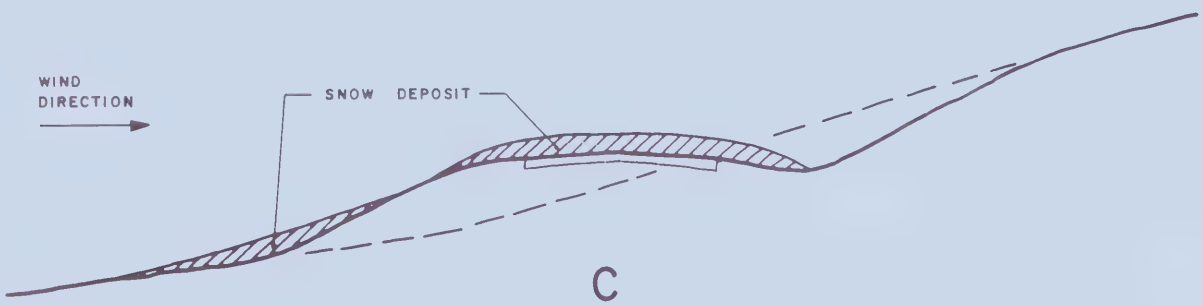
A

SNOWDRIFTS ON LOW EMBANKMENTS
UNDER 6 FOOT



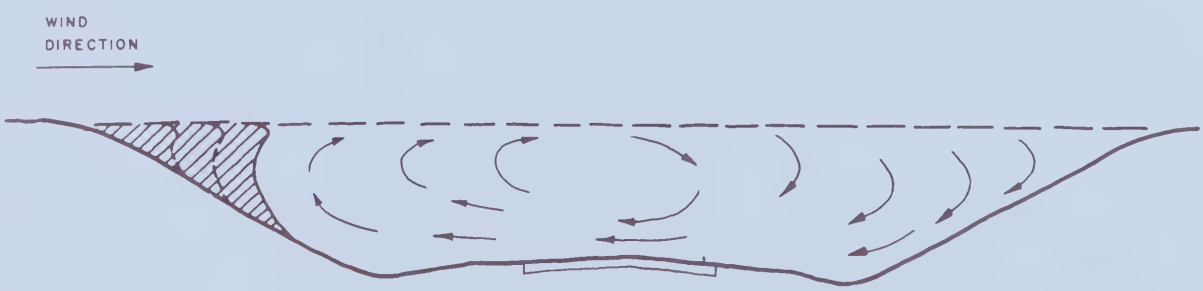
B

SNOWDRIFTS ON HIGH EMBANKMENTS
OVER 6 FOOT



C

SNOWDRIFTS ON HILLSIDE CUTS



D

SNOW DEPOSITS IN DEEP CUTS
OVER 20 FOOT

SNOWDRIFTING

EMBANKMENT CONDITIONS

Staging Considerations

The Ring Road is intended to be developed to an ultimate 4-lane facility with flexibility incorporated within the width of the median for the widening of an additional 2 lanes if and when required. One possibility in terms of staging of the 4-lane facility with its interchanges, grade separations, etc., would be to initially build a 2-lane facility with at-grade intersections. This would be a conventional approach if the ultimate facility would be at-grade or somewhat close to it.

If, however, lack of width required for an "environmental noise buffer zone" necessitates sections of the Ring Road be depressed, then staging in this context will be much more difficult. There is a strong possibility that at these isolated locations the ultimate section will have to be built at the outset, including portions of interchanges, grade separations, etc. Staging of the total facility should be investigated in more detail in the following stages.

Utilities

Exhibits 28 and 29 indicate the major utilities and oil and gas pipelines within the study area. There are a number of significant utility lines crossing the proposed corridor, particularly in the south and easterly segments. Although detailed study may be required for some of these utility crossings, in general there are no major construction difficulties anticipated with regard to such crossings. Further to this it can be added that a shift in the corridor location will not have a significant bearing on the problem of utility crossings. This will have to be investigated, however, in more detail as planning progresses.

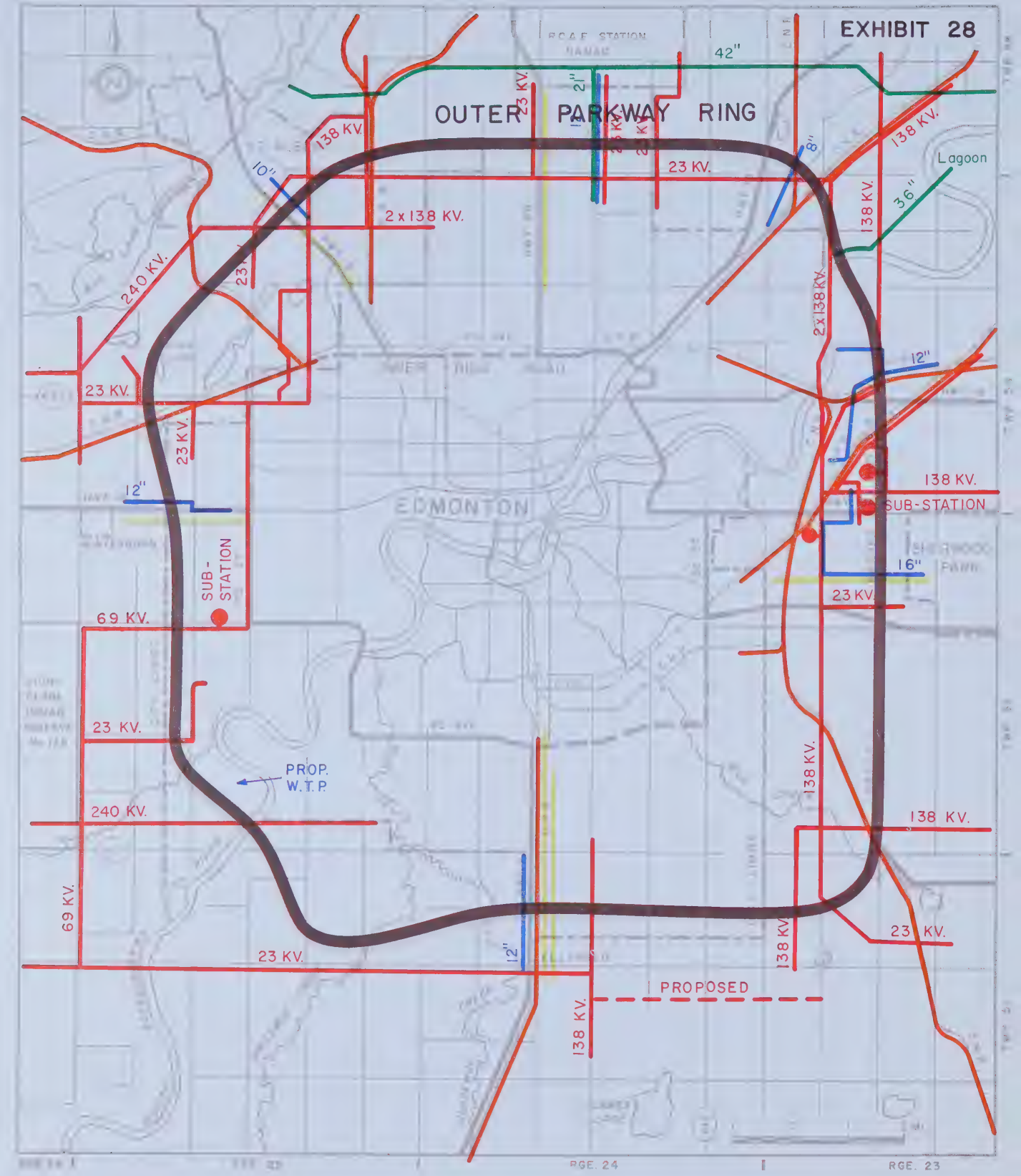
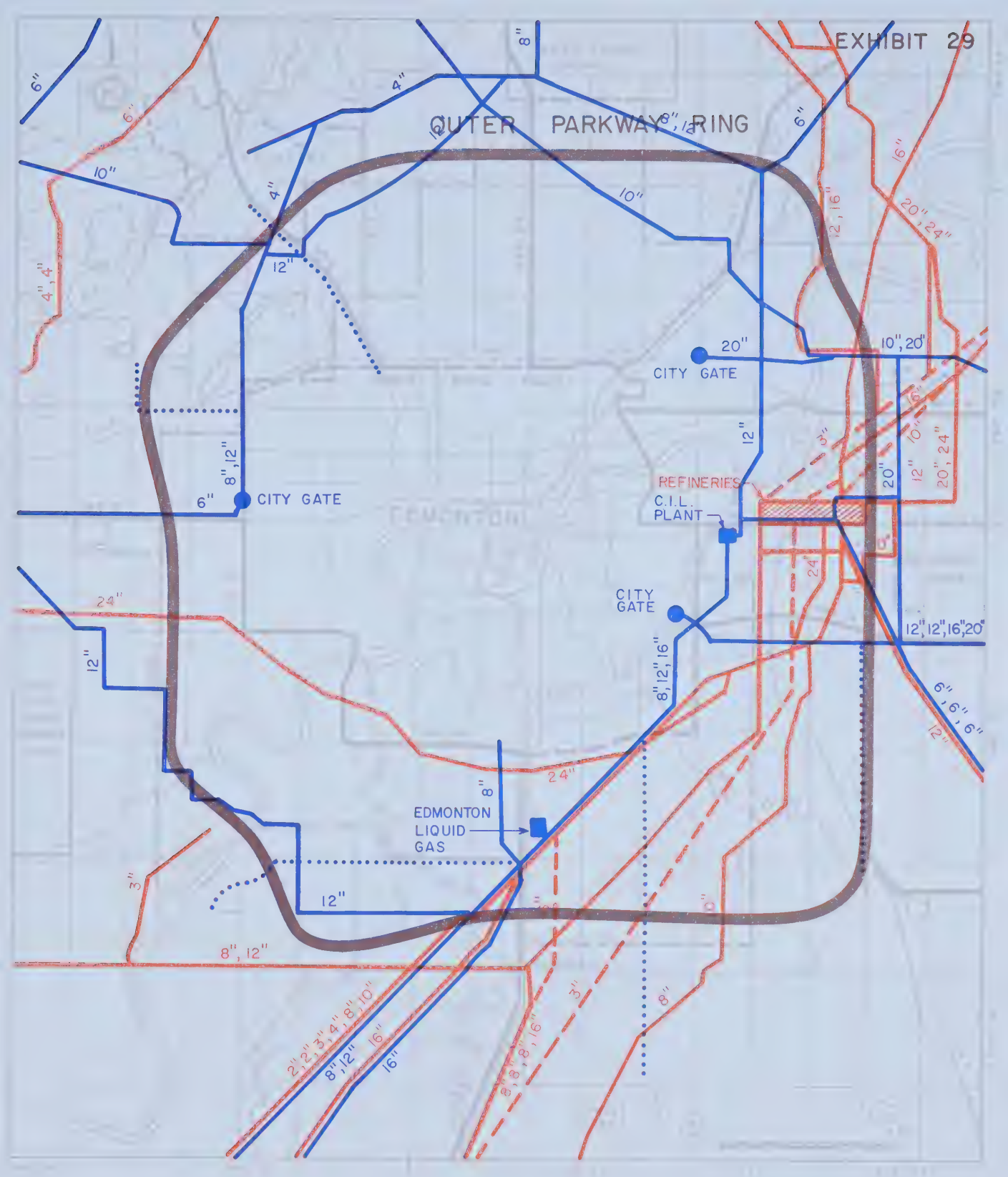


EXHIBIT 28
OUTER PARKWAY RING
42"
21"
23 KV.
138 KV.
10"
2 x 138 KV.
240 KV.
23 KV.
8"
138 KV.
Lagoon
36"
138 KV.
2 x 138 KV.
12"
23 KV.
23 KV.
138 KV.
SUB-STATION
12"
EDMONTON
16"
23 KV.
SUB-STATION
69 KV.
23 KV.
PROP. W.T.P.
240 KV.
138 KV.
138 KV.
69 KV.
23 KV.
12"
138 KV.
23 KV.
PROPOSED
138 KV.
RGE. 24
RGE. 23
POWER LINES
RAILWAYS
WATER MAIN
A.G.T. TOLL & DUCTLINE
SANITARY SEWER

UTILITIES



GAS AND OIL PIPE LINES

Cost

Separate cost estimates are given for Stage I and the Ultimate Stage of development. The initial investment would be that which is required to purchase land. This would be followed by construction of sections of a two-lane at-grade facility.

A 350' right-of-way has been assumed for Stage I. Although the total 350' would not be essential initially, it has been used because it is the minimum requirement for the Ultimate Stage. Any right-of-way for buffer zones and/or multiple-use purposes would be additional to the basic costs. The cost estimates are based on 1973 figures received from the Department of Highways and Transport and from the City of Edmonton, Land Department.

STAGE I: (Two Lane Two Way At-grade)

Road Construction:	$ 12,000,000
Bridges:	
Major: 2 @ $3,000,000/Structure	6,000,000
Minor: 2 @ $1,000,000/Structure	2,000,000
Total Construction Cost	$ 20,000,000
Land Costs:	
Alternate A - 1800 acres (350' width without interchanges)	$ 8,000,000
Alternate B - 4200 acres (350' width with interchanges)	$ 20,000,000
Total cost with Alternate A	$ 28,000,000
Total Cost with Alternate B	$ 40,000,000

ULTIMATE STAGE: (Four Lane Divided)

Road Construction:		$ 21,000,000
Interchanges:		
Minor:	21 @ $1,200,000/Interchange	25,200,000
Intermediate:	8 @ $2,000,000/Interchange	16,000,000
Major:	2 @ $3,500,000/Interchange	7,000,000
	1 @ $5,000,000/Interchange	5,000,000
Bridges:		
Major:	2 @ $5,000,000/Structure	10,000,000
Minor:	2 @ $1,000,000/Structure	2,000,000
Grade Separations: (Railway)		
	8 @ $750,000/Structure	6,000,000
	Sub Total	$ 92,200,000
Landscaping: (10% Sub Total)		9,200,000
Utilities: (5% Sub Total)		4,600,000
	Total Construction Cost	$106,000,000
Land Costs:		
Alternate A - 4200 acres (350' width with interchanges)		20,000,000
Alternate B - Additional land to provide 1000' right-of-way (500' each side of centerline)		20,000,000
	Total Cost with Alternate A	$126,000,000
	Total Cost with Alternate B	$146,000,000

SOCIO – ECONOMIC ANALYSIS

SOCIO - ECONOMIC ANALYSIS

Summary

1. If a Ring Road is to meet the needs of an environmentally conscious society, it must be carefully integrated into a transportation system which has as its main objective the improved flow of traffic within urban centres. The most pressing problem relating to traffic flow in urban centres relates to peak hour traffic into the inner city. It is clear, however, that a Ring Road cannot make a substantial contribution to the relief of peak load work-trip traffic unless it de-emphasizes the flow of automobile traffic to the downtown business district and acts as a collector of automobile traffic for other forms of penetration to the inner city. Thus, a Ring Road will make a significant contribution to urban traffic flows only to the extent that it feeds people into other forms of transportation to the city centre, the most obvious examples being light rapid transit and high-speed bus systems.

Thus, a fundamental characteristic of the benefits to urban traffic flow generated by Ring Roads is their carefully planned integration into the transportation system of the City - a system which emphasizes alternatives to the automobile for work trips and shopping trips to the city centre.

2. Within this context of an integrated urban transportation system, the concept of a Ring Road can lead to a wider set of benefits than the fundamental benefits associated with minimizing traffic congestion downtown. A Ring Road can provide a wide set of benefits of a recreational nature. It can provide the mechanism for Corridor planning of many kinds of utility systems. It can provide considerable potential with regard to bypass traffic and the minimization of truck concentrations in the interior city.

3. With proper land use planning, the concept of a Ring Road allows a city to maintain a wide area of flexibility with regard to urban form.

Ring Road construction is consistent with the continued development of satellite cities on the periphery of Edmonton. Ring Road development is also consistent with a development pattern around the perimeter of Edmonton, much as is planned for West Jasper Place, Mill Woods, Castlewood Downs, etc. However, the Ring Road would not preclude the development of the City along arterial road systems, if that is the development pattern which is chosen.

With regard to the matter of urban form and the continued growth of Edmonton, it is likely that a Ring Road may add to the comparative advantage which Edmonton already enjoys in the matter of economic and population development. It is quite likely that the process of industrial location would be influenced by a Ring Road, since it would provide significant transportation and other economies for firms contemplating expansion into the west generally, and Alberta specifically. The obverse of this observation, of course, is that a Ring Road will make it less attractive for business firms to choose plant location in one of the smaller cities of Province.

A final example of how urban form may be influenced by a Ring Road concerns the geographic placement of parks and recreational facilities. A Ring Road will alter the accessibility of the public to recreational facilities in that facilities in the vicinity of a Ring Road will be within easier access of a large part of residential population. Thus, this element tends to increase the planning horizon with regard to recreation facilities and potential supplementary uses of a Ring Road System.

4. If the Ring Road is justified by the wide set of benefits it makes possible, then it is important to note that supplemental benefits of the Ring Road give rise to additional costs. Recreational facilities and accessibility, an important benefit consideration, will add to the total costs of the project, first in relation to land acquisition

requirements and then in the matter of recreational facilities. While this does not alter the benefit picture, it does put them into a proper perspective. The importance of this cost-increasing element is demonstrated in the matter of land acquisition. If a 350 foot right-of-way is required for the transportation function of a Ring Road, then in some instances the proper amount of land to be acquired will be much greater than 350 feet, given environmental, recreational and related considerations.

5. With regard to the question of location of the Ring Road, let it be observed that the location in general terms is fairly well specified by existing plans and developments. In the northwest, the Ring Road must be placed between Edmonton and St. Albert; on the east, between Edmonton and Sherwood Park; on the west, on the western periphery of West Jasper Place. Thus, only in the south is there considerable choice with regard to optimal location, and that is restricted by the requirement that the Ring Road not be placed so far away that it loses its attraction to the urban dweller.

In summary, we conclude that a Ring Road cannot be judged, in and of itself, to be good or bad, desirable or undesirable, worth the investment or not worth the investment.

To the extent that such a facility is developed in the context of a host of desirable related policies, it could and should prove to be a contributor to the well-being of the City's citizens.

However, to the extent that such a facility is developed as a good in its own right, it is as likely to be a disaster as it is a success.

The potential benefits and costs, social, economic and environmental, discussed in this paper, must be analysed in light of these two approaches before they will serve to illuminate the critical policy issues at stake.

Introduction

The purpose of this portion of the study was to investigate the feasibility and desirability - from a social and economic point of view - of proceeding with the development of the planned Outer Ring Road around the City of Edmonton.

Specifically, the study addressed such questions as the following:

1. What are the preceived purposes of the proposed Ring Road? Are these purposes appropriate? Are they likely to be achieved? With what kinds of unanticipated consequences?
2. What costs social and economic, direct and indirect, are likely to be involved in the Ring Road itself and in its linkage systems?
3. What kind of benefits may be anticipated - in terms of the social, industrial, commercial, residential and cultural development of the City?
4. In light of such considerations of social and economic costs and benefits, what priority does the Ring Road deserve? How does it rate with other competitors in the process of urban development?
5. Is the proposed location of the road socially and economically ideal?
6. If the plan is to proceed, how should it be phased or staged?

The study attempted to provide systematic, though certainly not exhaustive, responses to these questions.

Hopefully, the report will provide a useful input into the processes of government policy-making, particularly as these processes are concerned with the costs, the benefits, and the socio-economic trade-offs involved in the establishment of priorities in public expenditures.

In an attempt to relate the methods to the processes of policy and decision-making, the following sequential steps have been adopted in the analysis:

(a) a clarification of objectives as perceived by the two involved authorities - the Province and the City.

(b) an analysis of interrelationships between the Ring Road and certain critical social and economic variables, with particular reference to other elements in the transportation system.

(c) an analysis of benefits and costs.

(d) considerations of special problems.

(e) an analysis of priorities and staging problems.

It should be noted that the benefit-cost analysis included only a limited number of quantifiable units, because available cost figures were rather gross approximations and because most potential benefits could not be expressed in dollar terms.

The Objectives of the Ring Road

The first step in the analysis of any public program is to clarify the objectives of that program. For lacking a clear view of objectives, one cannot proceed to make proper comparisons between the desired outcomes and the likely outcomes.

So, as a preliminary activity, discussions were held with representatives from the Provincial Department of Highways and Transport and from the City of Edmonton, to determine the objectives of the Ring Road from their respective points of view.

1. The Provincial Government Perspective

From the viewpoint of the Provincial Government, three important objectives seem operative:

1. To expedite the flows of city traffic, from points adjacent to or near the Ring Road to other points adjacent to or near the Ring Road. (For example: persons who live near and work near the Ring Road) The potential for the realization of this goal can be assessed in terms of the likely forms of development and, hence, likely levels of traffic in and out of the proposed road itself.

2. To reduce future costs by anticipating and providing for future needs. This aim rests on the assumption that, eventually, a road system is likely to be needed in the vicinity of the Ring Road and that to provide now for such needs should be to minimize costs, since land acquisition before development is more economical than after.

3. To provide a bypass for non-urban traffic. This aim relates to the diversion of flows of traffic on regional highway systems as these might impact urban traffic problems.

2. The City of Edmonton Perspective

From the point-of-view of the City of Edmonton, the Ring Road should serve the above objectives, and more:

1. To expedite flows of city traffic. (as in #1 above)
2. To provide a bypass for non-urban traffic. (as in #3 above) Note, that the City's concern here is primarily with truck traffic.
3. To reserve a "corridor" around the City. The expressed purpose here is (as in #2 above) to anticipate future growth and minimize costs by pre-planning.
4. To enhance the recreational potential of the "Outer City". Edmonton city officials anticipate that recreational benefits of many types will result from the Ring Road. A first recreational aim is to provide easier access for city residents to outlying recreational areas. A second aim is to provide such facilities as cycle paths and equestrian trails in the buffer zones surrounding Ring Roads. Yet a third aim is to ensure a green-belt parkway as part of the Ring Roads, with its attendant scenic benefits. Finally, the development of regional parks at points on or near the corridor is considered to be a feasible aim associated with the Ring Road.

All of these objectives and perceived benefits of the proposed Ring Road seem desirable and reasonable enough. But the questions are:

1. Will these objectives, in fact, be realized? Will the Ring Road produce the benefits expected of it?
2. If so, at what social and economic costs?

Socio-Economic Variables Related to Ring Road Development

1. Population

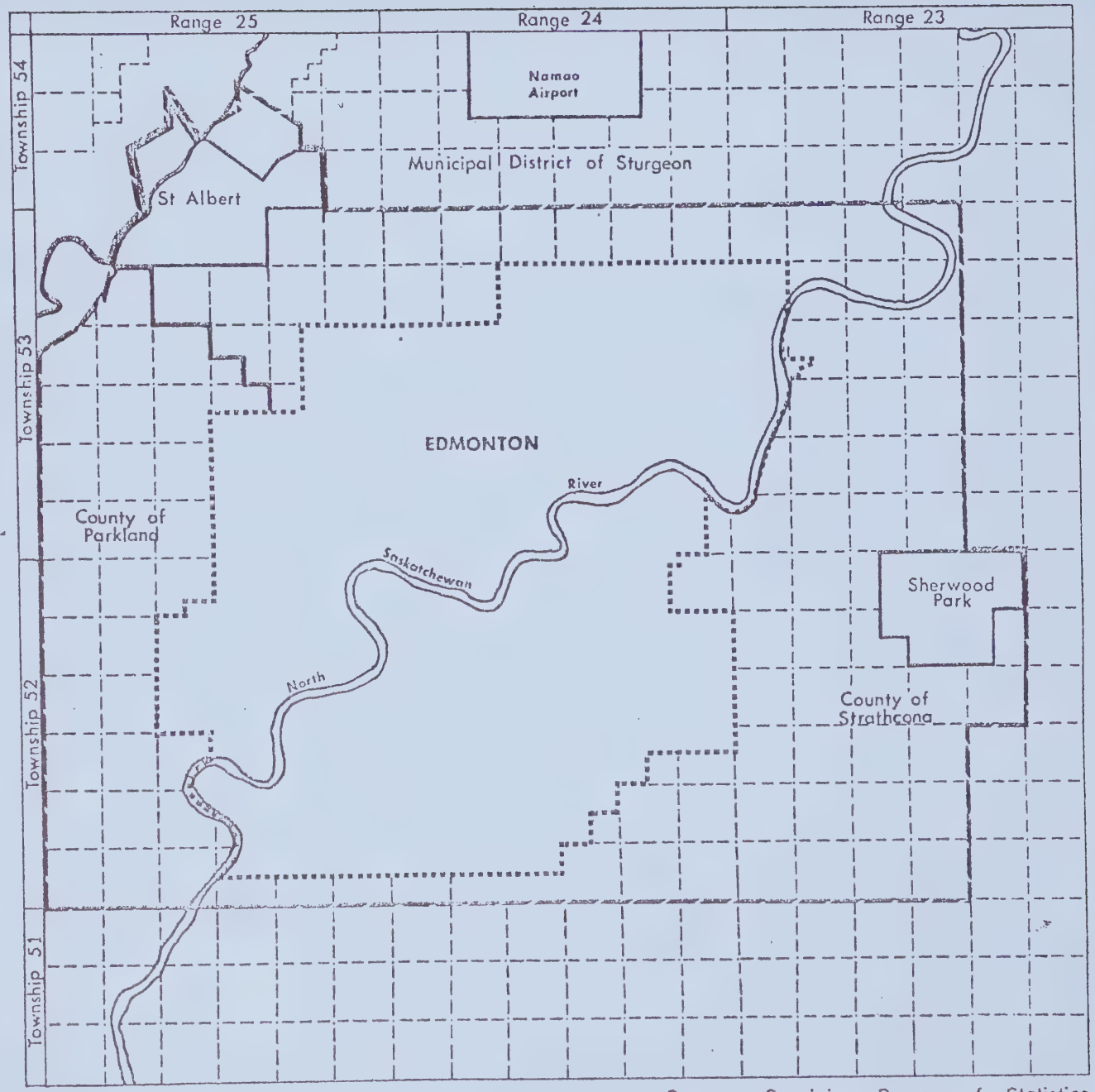
The potential benefits of ring roads are closely related to population levels. Though no precise model is available to prescribe the level at which ring roads become feasible, it is possible to examine trends and to move from these to speculations as to ultimate uses of the road.

In 1969 the Alberta Oil and Gas Conservation Board produced projections for the 15 census districts in Alberta to 1999, and by special arrangement with the Human Resources Research Council, to 2005. The eleventh census district is Edmonton; it includes an area considerably larger than the area usually included in the standard metropolitan area data. The study showed that the population in the Edmonton census district had grown from 235,474 in 1951 to 476,053 by 1966. Moreover, notwithstanding a decline in birth rate, the Edmonton census district was estimated to reach a 675,576 population level by 1980 and a million by 2000. (D.A. Seastone, Economic and Demographic Futures in Education: Alberta, 1970-2005, Human Resources Research Council, Edmonton, 1971)

In 1971 the Edmonton Planning Department developed a projection model for the Metropolitan Area of Edmonton, smaller than the region included in the Energy Board census district projections. This region is shown in Figure 1; the projections are shown in Table 1. Using the low fertility, medium migration assumptions, this projection shows a metropolitan population level of 587,493 by 1980. This projection is lower than that used in the Edmonton General Plan of 1972, because of lower birthrate assumptions. (Metropolitan Edmonton Population Projections 1971-2001, Edmonton Planning Department, 1971)

Yet another set of projections for the Edmonton Region was provided by the Edmonton Regional Planning Commission in May, 1973. These projections are shown in Table 2. These data indicate a growth of

Edmonton Census Metropolitan area 1966



Legend

1970 City boundary .....

1966 C.M.A. — — —

Source : Dominion Bureau of Statistics
April 1971

FIGURE 1

PROJECTED POPULATION, METROPOLITAN EDMONTON, JUNE 1, 1971-2001

	Low Fertility a			Medium Fertility b			High Fertility c		
Year	5,500 d	7,500 d	9,500 d	5,500 d	7,500 d	9,500 d	5,500 d	7,500 d	9,500 d
1971	471,551	473,586	475,611	471,551	*473,586*	475,611	471,551	473,586.	475,611
1972	483,891	488,012	492,118	483,891	*488,012*	492,118	483,991	488,113	492,216
1973	493,370	502,625	508,876	496,370	*502,625*	508,876	496,665	502,934	509,181
1974	508,965	517,418	525,682	508,965	*517,418*	525,862	509,569	518,037	526,484
1975	521,685	532,391	543,085	521,685	*532,391*	543,085	522,707	533,437	544,149
1976	534,548	547,548	560,549	534,659	*547,659*	560,661	536,102	549,152	562,183
1977	547,572	562,913	578,260	547,896	*563,252*	578,608	549,780	565,207	580,606
1978	560,737	578,470	596,211	561,396	*579,162*	596,919	563,739	581,589	599,419
1979	574,048	594,224	614,381	575,161	*595,396*	615,591	577,981	598,322	618,615
1980	587,493	610,114	632,761	589,195	*611,909*	634,618	592,504	615,352	638,178
1981	601,030	626,146	651,295	603,450	*628,702*	653,954	607,257	632,671	658,067
1982	614,617	642,270	669,957	617,895	*645,734*	673,572	622,218	650,250	678,260
1983	628,200	658,428	688,681	632,470	*662,948*	693,407	637,323	668,020	698,688
1984	641,737	674,565	707,415	647,139	*680,290*	713,415	652,528	685,929	719,296
1985	655,183	690,635	726,104	661,857	*697,714*	733,539	667,785	703,927	740,029
1986	668,508	706,605	744,704	676,584	*715,181*	753,734	683,058	721,974	760,839
1987	681,809	722,586	763,342	691,302	*732,681*	773,984	698,326	740,060	781,719
1988	695,073	738,529	781,979	705,993	*750,157*	794,252	713,574	758,131	802,620
1989	708,279	754,440	800,610	720,632	*767,611*	814,527	728,774	776,187	823,543
1990	721,407	770,303	819,212	735,205	*785,027*	834,792	743,924	794,219	844,470
1991	734,457	786,108	837,771	749,712	*802,398*	855,029	759,024	812,218	865,399
1992	747,441	801,861	856,302	764,154	*819,725*	875,258	774,081	830,208	886,344
1993	760,354	817,574	874,824	778,547	*837,036*	895,502	789,113	848,213	907,337
1994	773,198	833,252	893,332	792,892	*854,337*	915,769	804,127	866,246	928,389
1995	785,987	848,905	911,831	807,205	*871,642*	936,065	819,148	884,319	949,511
1996	798,735	864,529	930,337	821,511	*888,963*	956,420	834,202	902,459	970,734
1997	811,434	880,142	948,860	835,817	*906,325*	976,845	849,300	920,676	992,070
1998	824,102	895,748	967,398	850,147	*923,739*	997,361	864,466	939,000	1,013,584
1999	836,738	911,348	985,954	864,498	*941,218*	1,017,972	879,700	957,440	1,035,196
2000	849,341	926,940	1,004,540	878,892	*958,776*	1,038,701	895,017	976,006	1,057,007
2001	861,904	942,524	1,023,140	893,331	*976,419*	1,059,546	910,425	994,706	1,078,990

a Fertility rates assumed to decline 1% per annum from 1970 to 1985, held constant thereafter.

b Fertility rates assumed to decline 1% per annum from 1970 to 1975, held constant thereafter.

c Fertility rates assumed to remain constant at 1970 levels throughout the forecast. Mortality rates were assumed to remain constant at 1966 levels in all projections.

d Level of net migration to Edmonton assumed throughout the forecast.

NOTE: The italicized column represents the projection recommended by the City of Edmonton Planning Department.

SOURCE: City of Edmonton Planning Department, June, 1971.

TABLE 1

Source: Metropolitan Edmonton Population Projections, 1971-2001,
The City of Edmonton Planning Department, Research Branch, 1971

metropolitan population from 482,922 in 1971 to 682,300 in 1981. In the latter year, the City is expected to account for about 560,000 of this regional population. Hence, by 1981 some 122,300 of the people are expected to reside in areas outside the proposed Ring Road. These projections again are lower than those of the Edmonton Regional Plan of 1972, in which a regional population of 776,500 people was predicted, with about 620,000 residing in the City. (General Plan - City of Edmonton, Alberta, Office Consolidation, March, 1972)

The general picture that emerges from these assorted projections is clear. The rate of population growth in Edmonton is declining, as a result of decreases in birth rates and in-migrations. Birth rates are expected to continue to decline. Similarly, net in-migration which averaged 9,331 from 1950 to 1959, and 5,980 between 1960 and 1970, will continue to decline to an estimated level of 5,500 per year.

Nevertheless, Edmonton remains one of the fastest growing cities in Canada. It ranks as a major Canadian urban centre and will continue to grow because of the economic opportunities it offers. Even the low fertility, low migration assumptions of the planning department indicate a population of 861,904 by 2001.

Table 2

POPULATION CHANGE AND PROJECTIONS FOR METROPOLITAN-REGION URBAN AREAS BASED ON APPROVED OUTLINE PLAN DEVELOPMENT PROPOSALS

COMMUNITY	MID-YEAR				
	1961*	1966*	1971*	1976	1981
Edmonton	337,568	401,299	438,152	480,000	560,000
Devon	1,418	1,283	1,468	1,800	3,100
Ft. Saskatchewan	2,972	4,152	5,726	9,000	13,000
Leduc	2,356	2,856	4,000	7,000	10,000
Morinville	935	995	1,475	2,500	4,000
Spruce Grove	465	598	3,029	8,500	13,500
St. Albert	4,059	9,736	11,800	22.500	35,000
Stony Plain	1,311	1,397	1,770	2,900	4,000
Sherwood Park	2,923	6,339	14,282	29,000	33,000
Beaumont	-	234	337	2,000	2,400
Bon Accord	-	147	332	800	1,000
Gibbons	192	230	551	1,500	3,300
	354,189	429,266	482,922	566,500	682,300

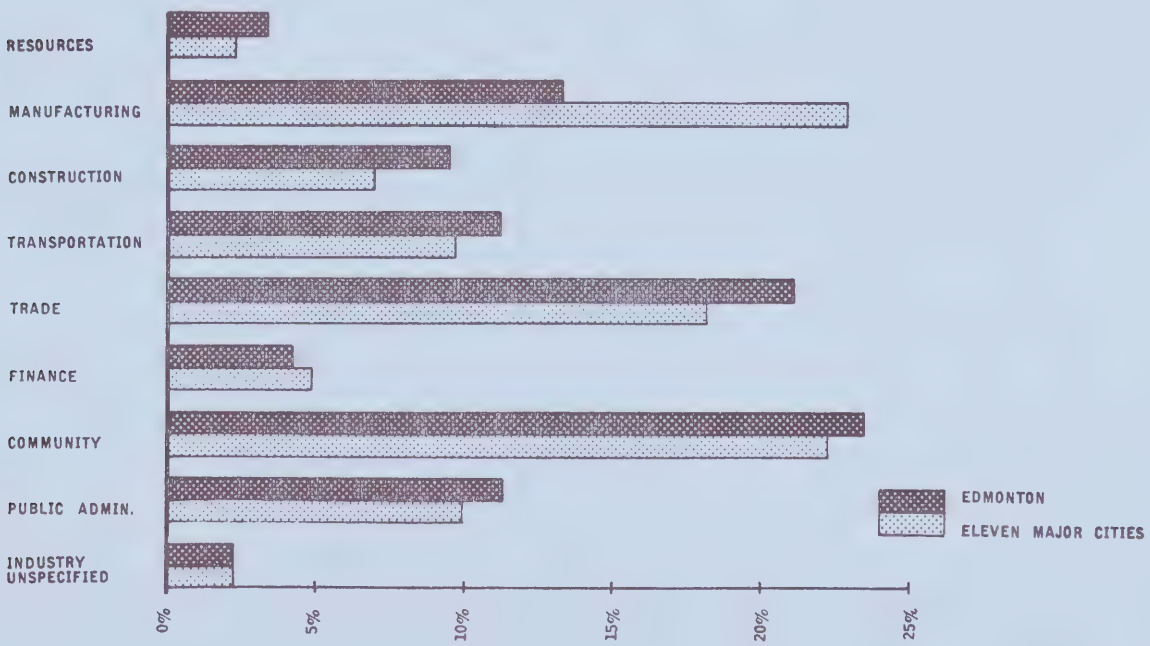
*Source: D.B.S. & Census Canada

2. The Economy

The nature and strength of the economy in and around the City of Edmonton is illustrated in Figure 2 below, which compares Edmonton to the average of 11 other Canadian cities in terms of percentage employment by industry. Only in manufacturing and finance is Edmonton employment lower than the other centres. That Edmonton could grow as rapidly as it has is remarkable in view of its relative lack of manufacturing activity, although this sector has developed rapidly in recent years. This figure reflects a strength in the Edmonton area economy inasmuch as it shows the range of comparative advantages the region has built for itself, from public administration as the Provincial Capital to resource activities centred around the petroleum and natural gas.

Figure 2

DIAG. 2. — PERCENTAGE EMPLOYMENT BY INDUSTRY IN EDMONTON AND ELEVEN MAJOR CANADIAN CITIES.



Source: General Plan, City of Edmonton, Alberta, Office Consolidation, 1972, Page 3.8.

Further indications of Edmonton's continued growth potential and performance should be noted. Using 1961 as a base year with an employment index of 100, Edmonton enjoyed the following index performances by August of 1972 in its various economic sectors: Manufacturing, 132; Construction, 167; Transportation, Communications and other Utilities, 177; Trade, 141; Finance, Insurance and Real Estate, 165; Services, 215; and Industrial Composite, 157. (Alberta Statistical Review, April, 1973, Alberta Bureau of Statistics, Edmonton)

Other indicators of economic growth verify Edmonton's continuing growth potential. In value of building permits, in bank debits, in trade, etc., economic growth continued during 1972. For example, the value of wholesale trade increased about 19 percent from February 1972 to February 1973; bank debits increased by about 12 percent from November 1971 to November 1972. (Ibid)

So, the question is not whether Edmonton will continue to grow but precisely how fast. The City's unique advantage relative to the continued development of Alberta's and Northwest Territory's resource base will undoubtedly add continued growth potential. Most interesting in this regard are the significant spin-offs that will accrue to Edmonton as the Ft. McMurray Tar Sands Deposits come into production. Edmonton, of course, is the largest big city close to the oil sands. As Great Canadian Oil Sands, Syncrude and other petroleum firms expand their operations in the development of hundreds of billions of barrels of petroleum in Alberta's oil sands deposits, further income and employment effects are certain to be felt in and around Edmonton.

Edmonton is strategically located as well a staging centre for further development of petroleum, natural gas and other resource activities in the Northwest Territories. If and when natural gas is piped from the Mackenzie Delta, the city and region will feel significant economic effects; if oil is piped from the Mackenzie Delta,

Edmonton will probably be the southern terminal for processing and/or re-distribution. In any event, continued development of the North will continue to exert pressure on Edmonton and Alberta.

Thus, we may assume continued vitality of the Edmonton regional economy with attendant growth implications for the regional population levels.

3. Geographic Distribution of Population in Edmonton

We have postulated in the previous sections that the Edmonton economy and population will continue to grow, although at a slower pace than was experienced during the 1950's and 1960's. Thus, although no standard is available to suggest a population level at which ring roads become feasible, to the extent that a growing urban centre of more than half a million people requires some form of ring road system, Edmonton has met this criterion.

But of equal importance to the question of population levels is the question of population distribution. The City of Edmonton has been concerned with this question and in its general plan has specific recommendations for residential growth in the metropolitan area. The City's general plan specifies that expected direction of population increase in the City to 1981 and the corresponding acreage requirements. Although the postulated increase in population from 1969 of 197,600 to a city total of 600,000 by 1981 is probably high according to more recent estimates, it is still informative to consider the City's plan for population distribution, as shown in Table 3. Of the estimated increase of 197,600 by 1981, 132,400 are expected in new growth areas. Total acreage requirements of this level of population increase is more than 6,600 acres.

Table 3

DISTRIBUTION OF GROWTH

Location	Population Increase	Approx. Acreage Requirement
West	17,700	890
Southwest	15,600	780
South	13,600	680
Southeast	39,400	1,970
Northeast	23,000	1,150
North	23,100	1,160
New Area Growth	132,400	6,630
Developing Area Growth	42,000	
Developed Area Growth	23,200	
Total Growth	197,600	

Source: General Plan, City of Edmonton, Alberta, Office Consolidation, March 1972.

Edmonton will probably be the southern terminal for processing and/or re-distribution. In any event, continued development of the North will continue to exert pressure on Edmonton and Alberta.

Thus, we may assume continued vitality of the Edmonton regional economy with attendant growth implications for the regional population levels.

3. Geographic Distribution of Population in Edmonton

We have postulated in the previous sections that the Edmonton economy and population will continue to grow, although at a slower pace than was experienced during the 1950's and 1960's. Thus, although no standard is available to suggest a population level at which ring roads become feasible, to the extent that a growing urban centre of more than half a million people requires some form of ring road system, Edmonton has met this criterion.

But of equal importance to the question of population levels is the question of population distribution. The City of Edmonton has been concerned with this question and in its general plan has specific recommendations for residential growth in the metropolitan area. The City's general plan specifies that expected direction of population increase in the City to 1981 and the corresponding acreage requirements. Although the postulated increase in population from 1969 of 197,600 to a city total of 600,000 by 1981 is probably high according to more recent estimates, it is still informative to consider the City's plan for population distribution, as shown in Table 3. Of the estimated increase of 197,600 by 1981, 132,400 are expected in new growth areas. Total acreage requirements of this level of population increase is more than 6,600 acres.

Table 3

DISTRIBUTION OF GROWTH

Location	Population Increase	Approx. Acreage Requirement
West	17,700	890
Southwest	15,600	780
South	13,600	680
Southeast	39,400	1,970
Northeast	23,000	1,150
North	23,100	1,160
New Area Growth	132,400	6,630
Developing Area Growth	42,000	
Developed Area Growth	23,200	
Total Growth	197,600	

Source: General Plan, City of Edmonton, Alberta, Office Consolidation, March 1972.

One of the more striking characteristics of residential population planning is the declining emphasis predicted for low density, single-family housing. As shown in Table 4, low density residential utilization of city land is expected to fall from 65 percent in 1961 to 50 percent according to existing land use plans. This is further illustrated in Table 5 which shows single family homes declining from 63 percent of residential units in 1961 to 51 percent in 1981, with a corresponding reduction in net residential acreage allocated to single family homes from 85 percent in 1961 to 79 percent in 1981. The largest expected increase in residential units is in the walk-up and high-rise apartment units.

Table 4

POPULATION DISTRIBUTION BY DENSITY AREA

	1961		1981	
Density	No. of People	Percentage	No. of People	Percentage
Low	205,000	65.0	365,000	59.0
Intermediate	104,000	33.0	175,000	28.5
Medium	4,000	1.4	35,000	5.5
High	2,000	.6	45,000	7.0
TOTAL	315,000	100.0	620,000	100.0

Source: General Plan, City of Edmonton, Alberta, Office Consolidation, March, 1972.

Table 5

DWELLING UNIT TYPES AND LAND REQUIREMENTS

Residential Units

	S.F.	2.F	Row	Walk-Up Apt.	High Rise	Other	Total
1961*	55,300	15,500	2,500	10,200	800	3,200	87,500
Percentage	63.2	17.7	2.9	11.7	.9	3.6	100.0
1981	93,200	19,300	9,600	41,700	16,400	1,800	182,000
Percentage	51.3	10.6	5.3	22.8	9.1	.9	100.0

Net Residential Acreage

1961*	8,500	1,000	150	140	10	200	10,000
Percentage	85.0	10.0	1.5	1.4	0.1	2.0	100.0
1981	13,300	1,600	600	1,000	100	200	16,800
Percentage	79.2	9.5	3.6	5.9	.6	1.2	100.0

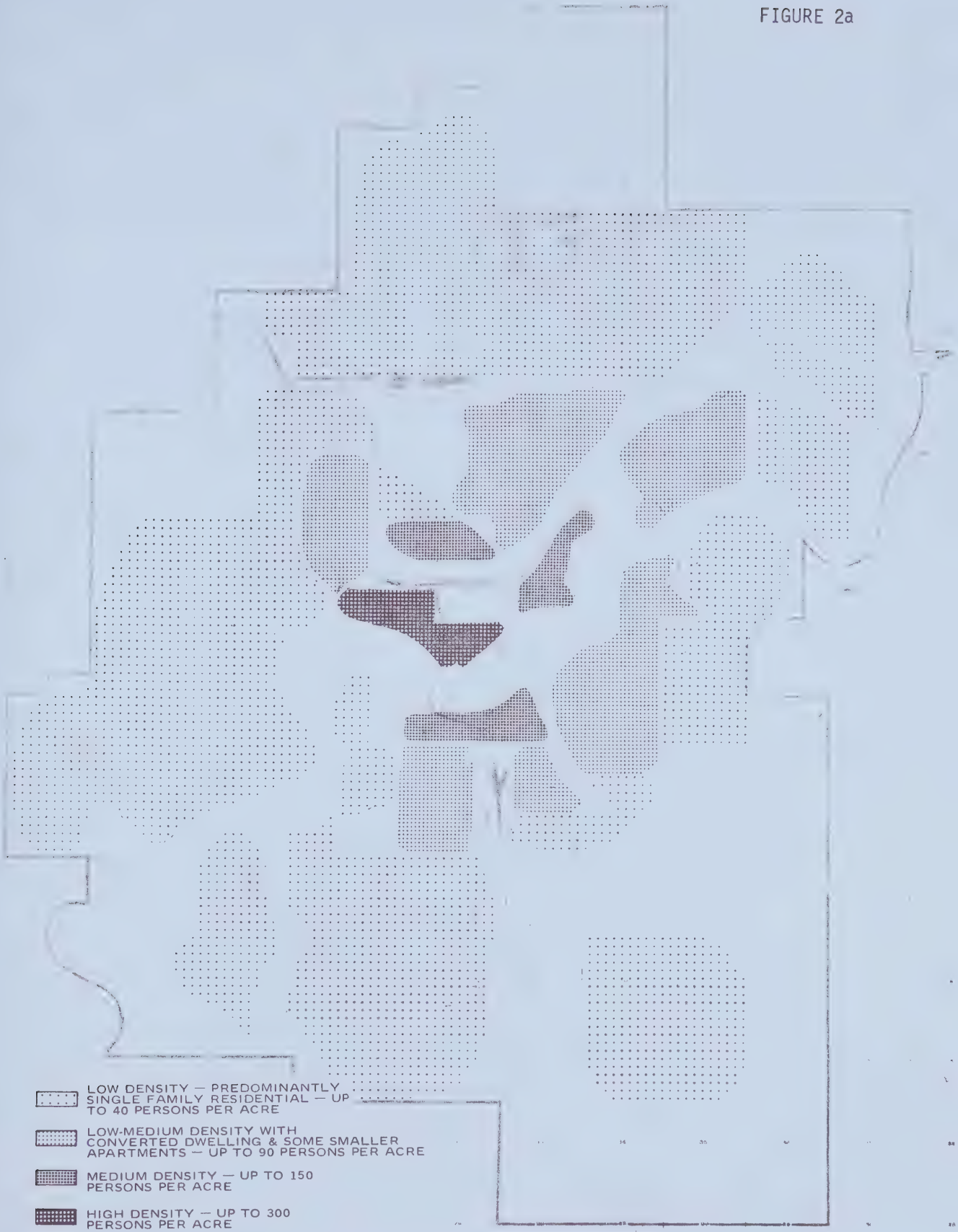
* 1961 figures include Jasper Place and Beverly

Source: General Plan, City of Edmonton, Alberta, Office Consolidation, March, 1972.

The geographic impact of this proposed land use is partially revealed in Figure 2a. While high density residential units increase in importance relative to low density single family units, it is the latter type of unit which appears on the land use plan for new suburban areas, in the vicinity of the proposed Ring Road.

The importance of these outlying areas in the overall plan for population growth is further demonstrated in Figure 3. While population is expected to increase modestly in the inner city and adjacent areas between 1961 and 1981, it is in the hatched areas and contiguous neighbourhoods that the major increase in population are expected to occur. In Figure 3 the postulated increase in population in the hatched areas is 132,463 although this could be smaller. Also, the 132,463 reflects an increase which is larger than is likely to occur by 1981.

FIGURE 2a


LOW DENSITY — PREDOMINANTLY SINGLE FAMILY RESIDENTIAL — UP TO 40 PERSONS PER ACRE
LOW-MEDIUM DENSITY WITH CONVERTED DWELLING & SOME SMALLER APARTMENTS — UP TO 90 PERSONS PER ACRE
MEDIUM DENSITY — UP TO 150 PERSONS PER ACRE
HIGH DENSITY — UP TO 300 PERSONS PER ACRE

THE CITY OF EDMONTON

EDMONTON GENERAL PLAN

RESIDENTIAL DENSITY BY AREA

RESIDENTIAL DEVELOPMENT

FIGURE 3

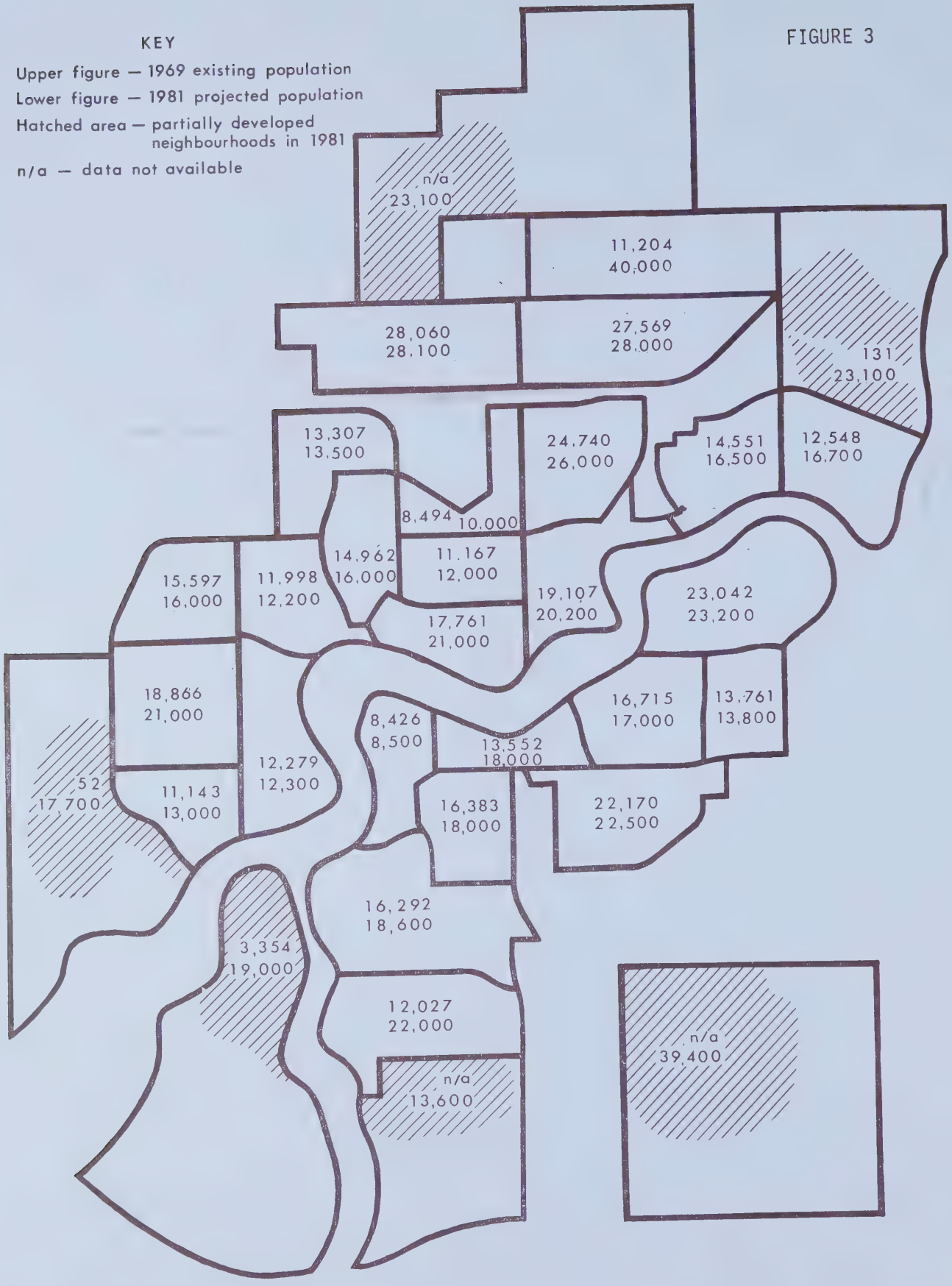
KEY

Upper figure — 1969 existing population

Lower figure — 1981 projected population

Hatched area — partially developed neighbourhoods in 1981

n/a — data not available



EDMONTON GENERAL PLAN

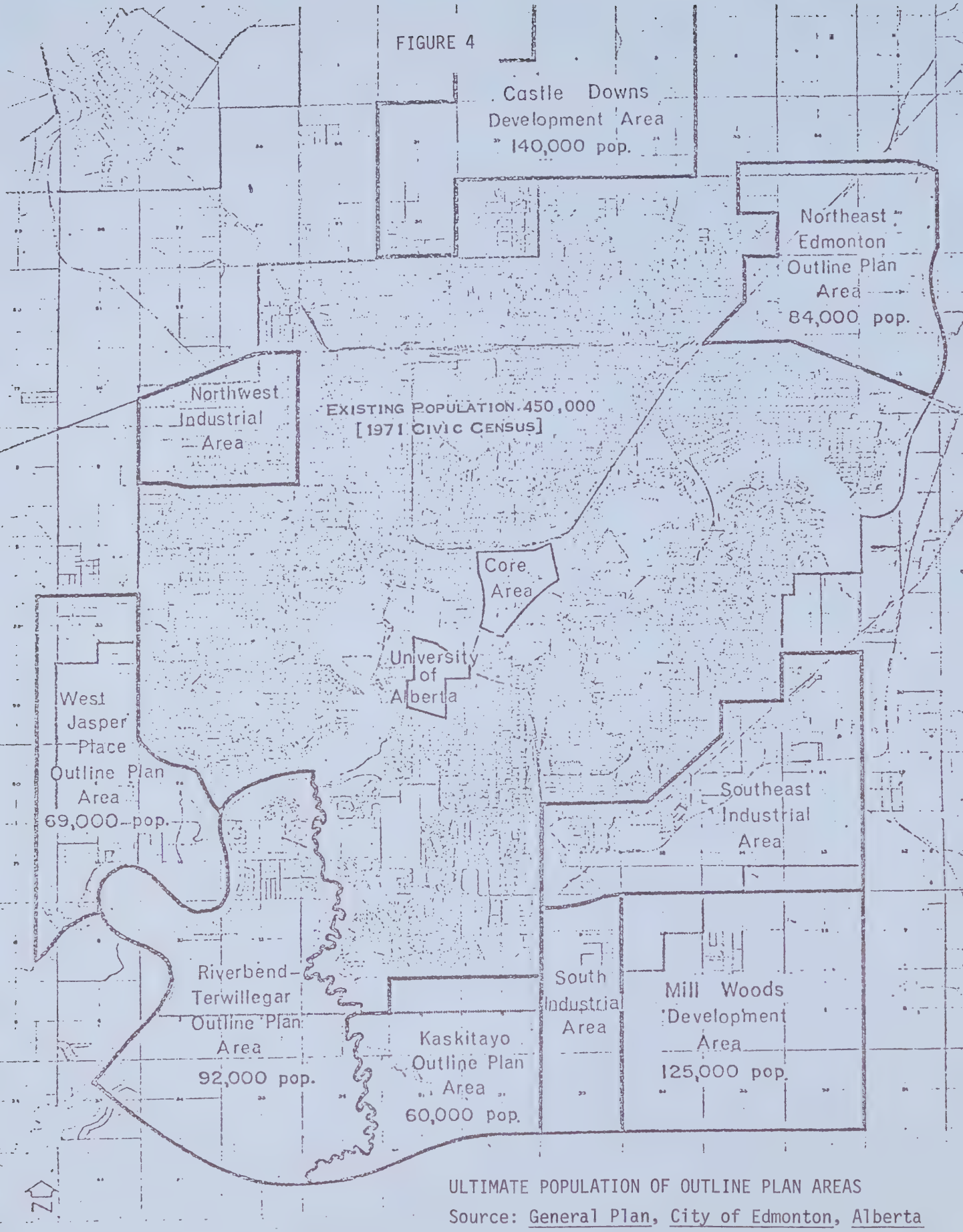
POPULATION DISTRIBUTION 1981

POPULATION AND EMPLOYMENT

Figure 4 shows the ultimate population planned for those suburbs which will lie close to the proposed Ring Road. While it is not possible to predict a precise time at which this population will exist, a population of 570,000 has clear implications for a ring road system in the sense that a large group of people will live within fairly easy access.

The employment implications of the population shifts discussed above are shown in Table 6 and Figure 5. Table 6 simply provides the employment data by economic sector which is expected to accompany the population growth. Figure 5 is more instructive with regard to the implications of employment location for the proposed Ring Road. It suggests that the employment opportunities in the outlying suburban areas of Edmonton will be small in comparison with residential population growth. The increase in employment of nearly 40,000 people in the inner city is expected to be greater than the employment growth in all the outlying regions of the city. This suggests, in turn, that a major transportation problem for the city will continue to be the movement of people and goods from the suburbs to the inner city.

Finally, in the matter of residential population expansion, Figure 6 suggests the time frame which the City of Edmonton has in mind with regard to developing the outlying suburbs. Of particular interest is the third stage of development, 1976-1981, which appears to push residential expansion by 1981 in the direction suggested in Figure 4.



ULTIMATE POPULATION OF OUTLINE PLAN AREAS

Source: General Plan, City of Edmonton, Alberta
Office Consolidation, March, 1972

TABLE 6

INDUSTRIAL EMPLOYMENT - METROPOLITAN EDMONTON

	1951		1961		1981*	
	Labour Force	%	Labour Force	%	Labour Force	%
Primary	2,550	3.9	4,337	3.3	8,340	3.0
Manufacturing	10,002	15.3	17,477	13.3	33,360	12.0
Construction	7,844	12.0	12,442	9.5	22,240	8.0
Transportation, Communication & Other Utilities	7,779	11.9	14,649	11.1	30,580	11.0
Trade	13,924	21.3	27,710	21.1	52,820	19.0
Finance, Insurance & Real Estate	2,484	3.8	5,467	4.1	16,680	6.0
Service & Public	20,265	31.0	46,278	35.2	111,200	40.0
Unclassified	523	0.8	3,216	2.4	2,780	1.0
TOTAL	65,371	100.0	131,576	100.0	278,000+	100.0

*The estimates for 1981 were based on definitions used in the 1951 Census and Estimates of 1961 Employment as compiled by the Dominion Bureau of Statistics. In the 1961 Census definitions for some categories were changed. Although total employment is not affected, some individual category estimates require revision.

+Includes 13,550 persons employed at the International Airport, Devon, Leduc, Spruce Grove, Namao and Fort Saskatchewan.

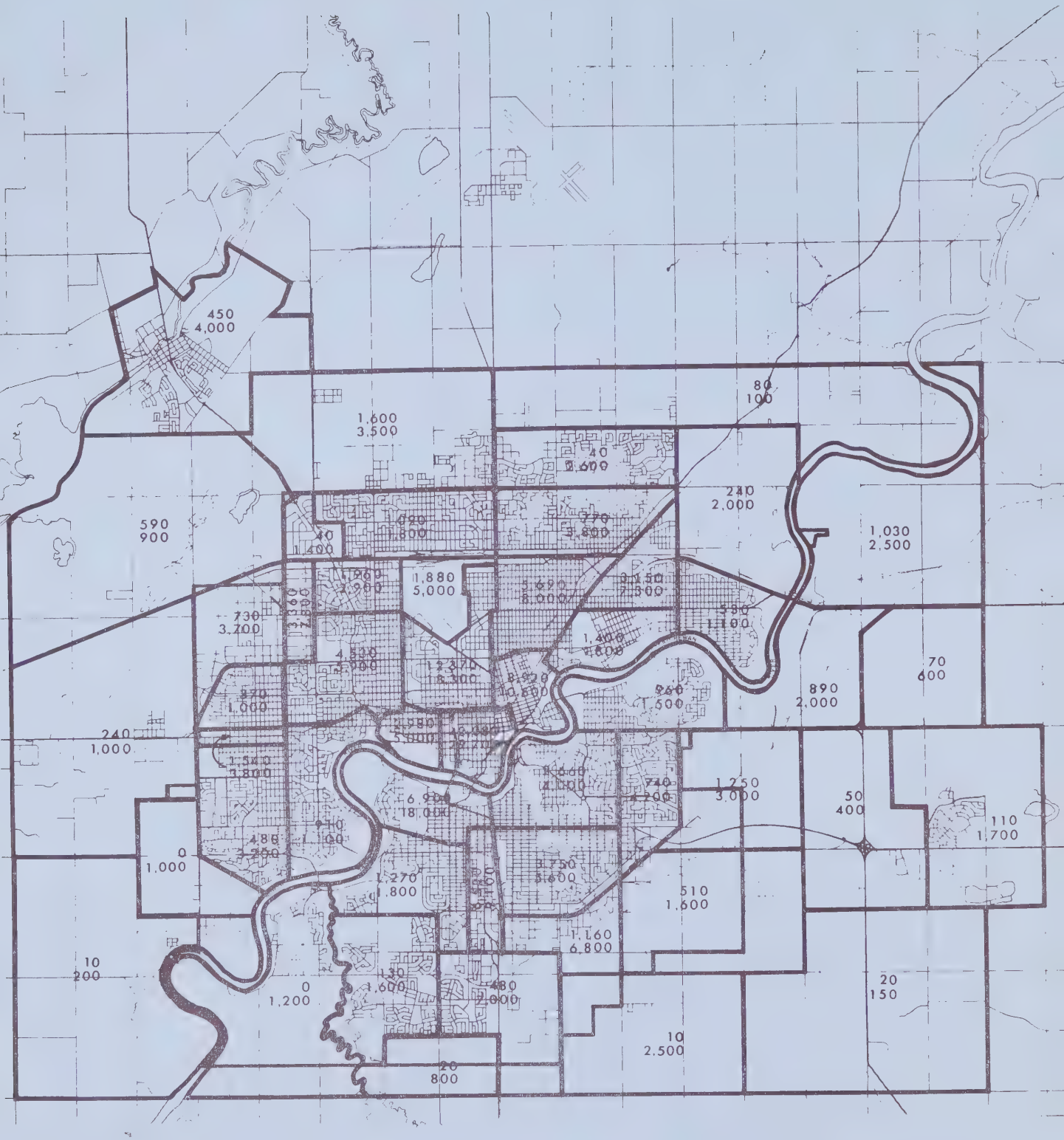
MANUFACTURING EMPLOYMENT - METROPOLITAN EDMONTON

	1951		1961		1967		1981	
	Labour Force	%	Labour Force	%	Labour Force	%	Labour Force	%
Food & Beverage	3,236	30.0	5,300	30.3	6,016	30.8	8,670	26.0
Clothing	800	7.4	1,139	6.5	1,820	9.3	3,170	9.5
Wood	536	5.0	918	5.2	824	4.2	1,340	4.0
Furniture & Fixture	317	2.9	598	3.4	738	3.8	1,340	4.0
Paper & Allied	71	0.7	363	2.1	276	1.4	670	2.0
Printing, Publishing & Allied	715	6.6	1,294	7.4	1,127	5.8	1,830	5.5
Iron & Steel Products	1,587	14.7	2,917	16.7	2,652	13.6	5.340	16.0
Transportation Equipment	1,904	17.6	706	4.0	925	4.8	2,000	6.0
Non-Metallic Mineral Products	167	1.5	820	4.7	1,278	6.6	3,000	9.0
Petroleum & Coal Products	762	7.1	1,113	6.4	626	3.2	1,170	3.5
Chemicals & Chemical Products	254	2.4	1,589	9.1	1,133	5.8	2,000	6.0
Miscellaneous*	379	3.5	631	3.7	2,090	10.7	2,830	8.5
TOTAL	10,797	100.0	17,477	100.0	19,505	100.0	33,360	100.0

*Includes: Textile & Knitting, Leather, Electrical, Rubber and Others.

Source: General Plan, City of Edmonton, Alberta
Office Colsolidation, March, 1972

FIGURE 5



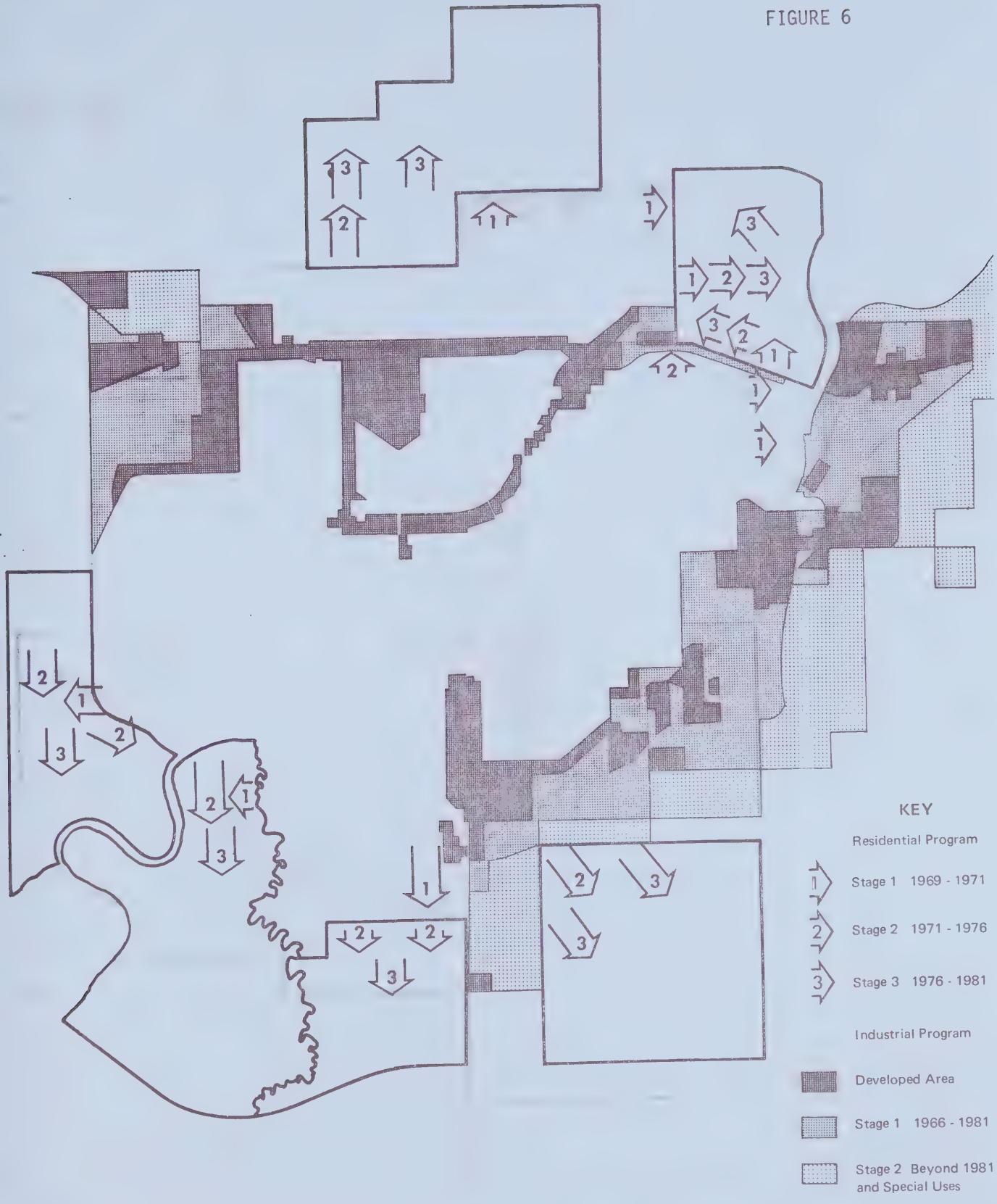
KEY

UPPER NUMBERS SHOW 1961 EMPLOYMENT

LOWER NUMBERS SHOW 1981 EMPLOYMENT

DIAG.3 — METROPOLITAN EMPLOYMENT, 1961 - 1981.

FIGURE 6



THE CITY OF EDMONTON

EDMONTON GENERAL PLAN

STAGING PLAN

PROGRAMMING

4. Commercial Development in Edmonton in Relation to the Ring Road

Figure 7 suggests the direction of commercial development in Edmonton as a function of expected population growth and postulated land use plans. Existing commercial development expands significantly in the direction of district and regional shopping centres. In this instance, the casual interface between commercial development and the Ring Road is likely to be different from that between residential population and the Ring Road. That is, the Ring Road is seen primarily as a vehicle for expediting the flow of traffic from residential suburbs that are already planned and to which the Ring Road will correspond and provide a potentially useful purpose. There is no indication that residential land use plans would be significantly changed if the Ring Road were not built, although this does not deny the potential impact of ring road systems on the development of perimeter residential systems as opposed to arterial or ship-city residential systems as alternative forms of urban growth.

The point that needs to be made here is that commercial development is quite likely to be affected by the construction of a Ring Road. If the experience of other cities in North America can be used as illustrative of what happens to commercial development when ring roads or beltways are constructed, then it is likely that regional shopping centres particularly will be affected by a Ring Road. What tends to happen, for example in Washington, D.C. where the Ring Road divides Washington from its Maryland and Virginia suburbs, is that major shopping centres tend to cluster around the Capitol Beltway. Where major arterial streets intersect the beltway regional shopping centres have appeared for obvious reasons. Origin and destination studies indicate that the Capitol Beltway becomes a mechanism for large-scale shopping trips, wherein residents of Maryland suburbs will gain access not only to Maryland shopping centres but to shopping centres in Virginia as well, and vice versa. Concurrently, of course, the Capitol Beltway is used widely for part of the work trip from the suburbs to downtown Washington, D.C.

FIGURE 7

EXISTING COMMERCIAL DEVELOPMENT

ANTICIPATED COMMERCIAL DEVELOPMENT — 1981

EDMONTON GENERAL PLAN

EXISTING AND ANTICIPATED COMMERCIAL DEVELOPMENT

COMMERCIAL DEVELOPMENT

Thus, there is some evidence to suggest that the Ring Road System in Edmonton will affect the geographic placement of regional shopping centres; and that some of the regional shopping centres now planned will shift to locations contiguous to the Ring Road, in turn being replaced by district, rather than regional shopping facilities. On the other hand, the experience cited - that of Washington, D.C. - relates to a region in which the population has leaped that of Capitol Beltway and moved way beyond into suburban Maryland and Virginia. Of course, if Edmonton population were not to expand beyond the Ring Road to a significant extent, the likelihood of shifts in regional shopping centre locations would be reduced.

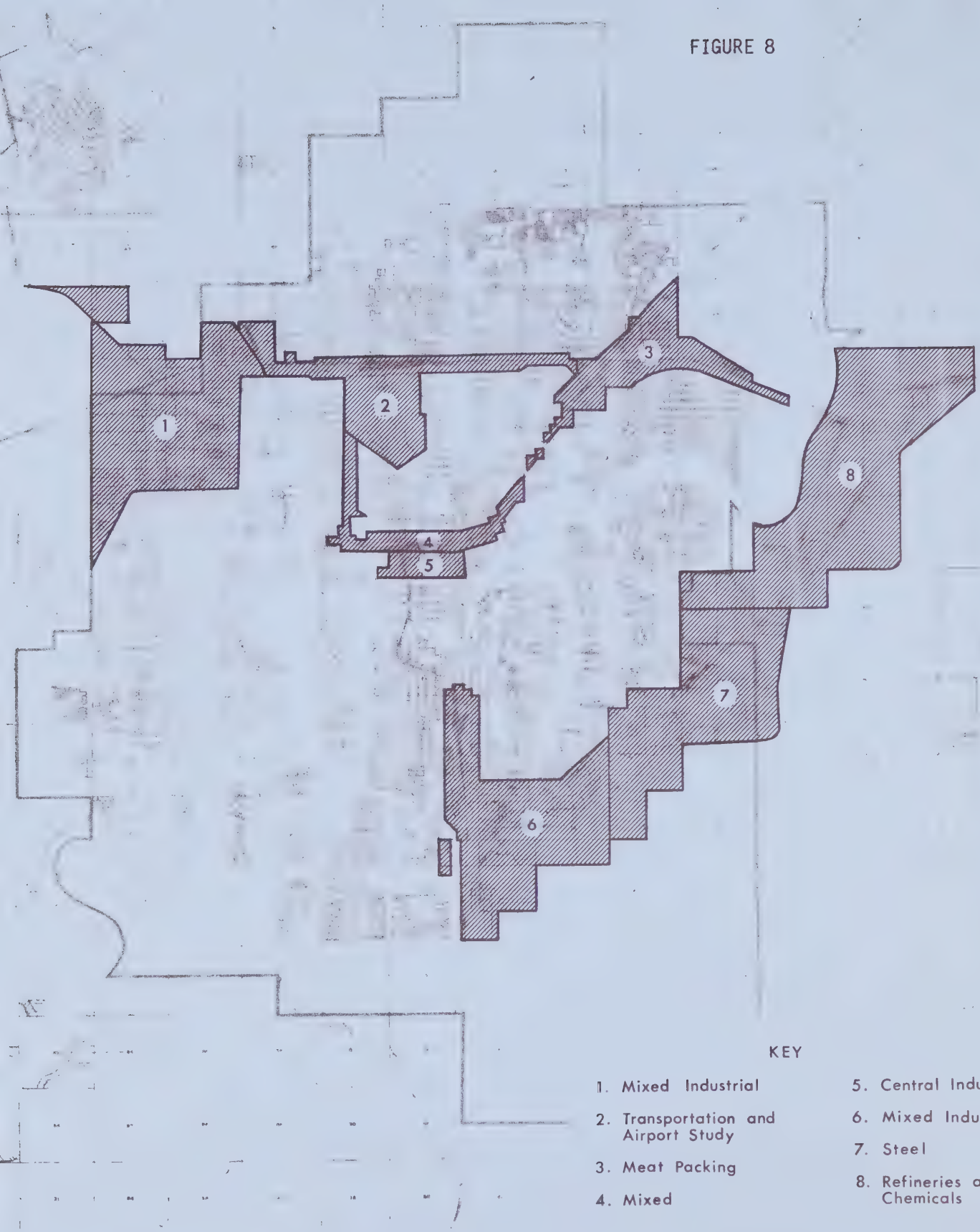
The impact of ring roads upon commercial displacement in existing suburbs and inner cities seems to be a problem area which has generated very little research. Suffice it to say in this connection that in a city with major growth potential the impact of commercial development along a ring road on established shopping centres will probably be to remove some of their growth potential rather than to eliminate the basic needs for established facilities.

5. The Edmonton Ring Road in Relation to Industrial Development and Land Use

In Figure 8 are shown the industrial land use patterns built into Edmonton's current land use plans. According to the 1972 general plan, there were 4,000 acres used for industrial purposes in 1964, projected to grow to 9,200 acres by 1981. In 1964 there were 7,000 vacant industrial acres in the city, projected to decrease to 1,800 by 1981. In the remainder of the metropolitan area, there were 2,700 acres used for industrial purposes in 1964, projected to increase to 4,800 by 1981. Thus, by 1981 the metropolitan area expects to have 14,000 acres of land devoted to industrial use plus an unspecified amount of industrial reserve, somewhat in excess of 1,800 acres. (General Plan, City of Edmonton, Alberta, Office Consolidation, March, 1972, p. 7.4)

As demonstrated in Figure 8, industrial land use plans cover all sections of the city except the southwest quadrant, radiating from the inner city to the northwest and the northeast periphery but not extending beyond the suburbs in the southeast. Industrial areas 1 and 8 approximate the Ring Road location, and it is not unlikely that further industrial development will be found for some of the areas outside the proposed Ring Road, particularly if the road becomes a reality. As will be noted subsequently, activities such as truck terminals and service facilities would find a natural attraction in the vicinity of a Ring Road.

FIGURE 8



KEY

1. Mixed Industrial
2. Transportation and Airport Study
3. Meat Packing
4. Mixed
5. Central Industry
6. Mixed Industry
7. Steel
8. Refineries and Chemicals

THE CITY OF EDMONTON

EDMONTON GENERAL PLAN

INDUSTRIAL DISTRICTS

INDUSTRIAL DEVELOPMENT

6. Some Preliminary Conclusions About Land Use Planning and the Ring Road

Very briefly, we may note the following implications of the Ring Road in relation to existing land use plans. With regard to residential use, the City already plans to grow in a perimeter fashion, not in the direction of certain major arterials. Thus, residential land use plans are consistent with the concept of a Ring Road and will tend to be reinforced by a Ring Road System. In the matter of commercial land use plans, the Ring Road could have a substantial impact in re-directing commercial growth, and particularly regional shopping centres, to ring road-arterial road intersections. Industrial land use plans in the Edmonton region are not closely related to the development of a ring road complex and there is some likelihood that industrial development in the vicinity of the Ring Road would develop at the expense of industrial development in other areas of the City. The existence of a Ring Road with significantly large buffer areas permissive of recreational use would influence the direction of park and recreational development in the Edmonton region. A Ring Road would also be likely to have an important impact on the location of regional parks.

COSTS

As a point of departure in estimating the costs of the proposed Ring Roads, we may note that the proposed length of the system is 46.5 miles, as shown in Table 7 below. Only about 10 miles of this distance is presently developed as a roadway.

Table 7

AREA OF CITY	86.6 Sq. Miles (by planimeter)	
AREA INSIDE RING	154 Sq. Miles (by planimeter)	
LENGTH OF RING		
South Fwy.	- S.W. Fwy. to Bretona	10.0 mi.
East Fwy.	- Bretona to Hwy. 15	13.5 mi.
North Fwy.	- Hwy. 15 to Hwy. 2	9.0 mi.
West Fwy.	- Hwy. 2 to S.W. Fwy.	14.0 mi.
		46.5 miles

Source: Provincial Department of Highways and Transport

In developing the costs of the proposed Ring Road four aspects have been examined - the costs of land, the costs of highway construction, additional costs and external costs. The proposed facility is a two-lane divided highway with provision for a third lane when required. The cost estimates are based on a 350 foot right-of-way two-lane divided highway with all required interchanges, bridges, overpasses, etc., as indicated on plans by the Department of Highways and Transport. Present costs have been used; no attempt to include inflation or borrowing cost factors has been made. No estimates have been included for penetrator roads required to join the Inner Ring Road and the proposed Metropolitan Edmonton Transit system, or (apart from interchanges) the roads required to join existing provincial highways.

Land Costs

Table 8 indicates the land area required for the proposed Ring Road and its cost based upon current land costs received from the City of Edmonton and the Department of Highways and Transport.

Table 8

Land Area Requirements and Costs of the Proposed Ring Road

	Area (acres)	Cost ($)
Right-of-way (350 feet wide)	1,800	$ 8,000,000
Interchanges	2,400	12,000,000
SUB TOTAL:		$20,000,000
Additional Buffer (500 feet each side of Center Line)		20,000,000
TOTAL LAND COST:		$40,000,000

These figures are considered conservative for several reasons. Rapidly escalating land prices may soon eclipse the costs used here. If a multiple use concept is adopted to develop the many potential uses associated with the Ring Road Corridor, a much wider Corridor will be required. Also wider buffers may be required, especially in residential areas, to reduce noise levels.

Construction Cost

The cost for construction of the complete facility with interchanges is estimated at $110 million, bringing the total cost, with land, to $150 million.

Additional Costs of a Ring Road Corridor

To this point we have only discussed in a very general way the two sets of costs directly related to the Ring Road System: the costs of land acquisition and the costs of highway construction. As noted, however, in the discussion of objectives, and as will be further analyzed in the discussion of benefit considerations, it is unlikely that a Ring Road System will be justified on grounds of highway considerations alone. Indeed, the land acquisition costs as outlined above contemplate a wider set of activities than highway construction. Thus, it is not legitimate to discuss a wider set of objectives of a corridor and a wider set of benefits which will flow from a corridor without at least initiating some discussion of the wider set of costs these activities will generate.

It is not possible with existing data to suggest even a range within which these additional costs will fall. All that can be done at this point is to mention the cost-increasing activities which serve as part of the justification for the Ring Road Corridor. Cycle and equestrian paths, for example, are likely to be interesting and well-received additions to a Ring Road Corridor, but not without cost. If regional parks are developed either contiguous to or in some geographic relationship to the Ring Road Corridor, they will represent an activity which creates broad public support. But at the same time, they add significant incremental costs to the project. On the other hand, if regional parks in relation to the Ring Road just substitute for parks in other places, there is no reason to assume significant cost increases. If the Ring Road Corridor requires a significant amount of expansion, landscaping and/or engineering innovations to make it more consistent, for example, with community noise standards, then this is an incremental cost which should be brought into the cost analysis. This suggests a different category of costs, however, which will be discussed under the heading of externalities.

External Costs of a Ring Road

By external costs of a Ring Road we refer to those incremental costs which derive from the development, construction and use of a Ring Road Corridor which are not part of the direct transaction costs such as land acquisition and highway construction. A case in point might be the environmental costs which a poorly designed corridor would impose on the communities in the form of noise pollution, air pollution, water deterioration, etc. If society accepts these lower standards, the cost takes the form of environment quality of life changes. If society imposes standards and takes action to eliminate the environmental costs, then the costs will most often take the form of incremental spending by public agencies. In either case, cost increments have occurred, either environmental or monetary.

On the other hand, it would be unwise to suggest that only external dis-economies such as scenic pollution will attach to the development of a Ring Road Corridor. It is entirely possible that external economies or benefits can be generated by a Ring Road Corridor. For example, if the Ring Road were to have a significant impact on vehicle movement into the inner city, dispersing truck traffic, for example, to peripheral eco-systems which can more easily absorb impurities without serious effect, then an external benefit of the Ring Road will occur. The possibility of external benefits is mentioned here only in the interest of pointing out that they may occur as a partial offset to external costs, which should be clearly treated as a facet of the total cost of the proposed project.

The other most significant externality, also in the form of an external cost, which will probably grow out of the Ring Road Corridor relates to the impact of the project on the budgets of the City. It is entirely possible, for example, that the construction of a Ring Road Corridor will impose incremental costs on City budgets in relation to interchanges between arterial roads and the Ring Roads; in relation

to improving arterial roads and penetrator systems, etc. The reason that this should be treated as an external cost in relation to City budgets is that it may not correspond with priorities which the cities have developed for themselves in the design of transportation systems. If this occurs, and city values and priorities must take a different order and sequence than planned, a serious problem of inter-governmental relationships occurs. This question of values and priorities will be discussed in more detail later.

Related to this external impact on the budget of the City is the possible indirect cost related to other forms of city services which may be generated by Ring Road Corridors. For example, if the Ring Roads were to have the effect of dispersing residential population to suburban areas lying outside the Ring Roads in place of filling in developing areas with the Ring Roads, then it is clearly possible that the costs of local government provision of water, sewer systems, etc., would be increased in at least two ways. First, the costs would increase by extending the utility systems greater lineal distances; and second, the cost would increase as a result of less than maximum use of utility services already in place in developed and developing areas of the cities inside the Ring Road Corridors. In other words, if the Ring Roads increase the tendency to urban sprawl, there will be corollary increases in unit costs of utility services.

Finally, in the matter of possible external costs, is the potential dislocation of established commercial enterprises and shopping centres. If the Ring Roads have the effect of displacing and redirecting commercial traffic from already existing firms to regional shopping centres peripheral to the Ring Roads, then some of the cost of Ring Road Systems will be borne by business enterprises which lose out to new facilities near the Corridor. Again, there will be external benefits such as added convenience to consumers and some dispersion of commercial trucking. But it should be noted that these benefits may be partially offset by less-than-optimal use of existing facilities and possible deterioration of established shopping centres.

This same phenomenon can occur in residential facilities. As home owners forsake the older areas of a city for the more attractive and often less expensive homes and land in suburbia, serious problems of under-utilization in older sections of a city can occur. One of the troublesome facets of this under-utilization of existing facilities has occurred in both Edmonton and Calgary in recent years in the form of a large number of spare classrooms in public schools in older sections of the cities. The trend is exacerbated in any tendency by local government to subsidize extended services and utilities.

Potential Benefits

This analysis of the potential benefits which may flow from the development of a Ring Road Corridor will not follow what has become the conventional approach of monetizing in dollar terms the benefits of public programs and comparing them with cost estimates. We feel the questions are too important to be subjected to the traditional benefit treatment wherein monetized benefits are compared to costs in an effort to derive benefit-cost ratios or rates of return analysis. The difficulty with that approach is that many kinds of benefits cannot be quantified, let alone monetized, and thus attempts to define benefit-cost ratios are necessarily incomplete and extremely dangerous when used for policy analysis. Benefit-cost ratios from which important benefits are necessarily excluded, and yet which masquerade as being capable of making decisions, will inevitably do a serious dis-service to the art of policy determination. Thus, in the discussion which follows, we will make no laboured assumptions for the purpose of quantifying the monetizing benefits, when good judgment suggests that few quantities or dollar values are meaningfully available.

1. The Impact of Ring Roads on Urban Form

A first fundamental question which needs to be asked with regard to the flow of benefits which may result from Ring Road Corridors is: can the impact of Ring Roads be directed in such a way as to beneficially affect the urban form of the city? The question is vital because urban form can be influenced in undesirable as well as desirable ways by particular transportation systems.

One facet of this question of urban form relates to the net impact of a Ring Road on the rate of economic and population growth. Will the corridors act as a deterrant to economic and population growth? We find little, if anything, to suggest that the rate of economic and population growth will be depressed by Ring Roads. On the contrary, there is reason

to believe that the availability of land in the vicinity of a Ring Road will act as an attraction in industrial location decisions. That is, Edmonton with Ring Road Corridors will be more likely to attract new industrial enterprises, with the resultant set of economic spin-offs, than would be the case in the absence of Ring Roads. Location decisions could be favourably affected by transportation cost savings alone in instances where export industries could concentrate on the bypass created by the corridors.

Whether or not this impact on industrial development, economic and population growth and, therefore, urban form is desirable, depends upon public policy toward economic growth in Alberta and, more specifically, in Edmonton. One element, however, requires specific comment. Ring Roads are likely to make the city more attractive for industrial development, relative to smaller towns and cities in the Province, than it would be in the absence of Ring Roads. Thus, if Provincial Government policy is to direct economic growth away from existing urban centres and toward smaller cities, the potential conflict between this objective and the impact of Ring Roads on economic growth should be noted.

Another facet of the impact of Ring Roads on urban form was dealt with in the previous section. That is the potential effect Ring Roads will have on the location of commercial enterprises and shopping centres; as noted previously, there are both benefits and costs associated with this development.

But, the relationship between residential growth, dispersal and urban form is worthy of note. If the development of a Ring Road effects shift in residential population from older areas within the city to new suburbs beyond the Ring Road, this urban sprawl is not necessarily a benefit to the cities, even though the newly dispersed population will then have occasion to use the Corridor in many ways, and will therefore increase the traffic flow along the Corridor System. It remains a vital question whether or not any significant benefit has accrued to cities by

virtue of this urban sprawl, which in turn has generated increased traffic on the corridor.

Suffice it to say, in this regard, that one of the most important questions from the city perspective is how Ring Road Systems can be used to affect changes in urban form which confer a net benefit on urban populations. For example, if Ring Roads were to concentrate residential development within, along and outside the Corridor instead of having it develop along specific arterials in the form of residential strip development, this could confer some benefits on cities. One of the important considerations in Ring Road development, then, would appear to be a close liaison between Provincial and City Governments in the interests of maximizing the benefits of changes in urban form attendant to Ring Road Corridors. An obvious illustration of the potential payoff involved in this close coordination relates to city, regional and provincial park facilities.

2. Transportation Planning in Relation to a Reserved Corridor

As one considers the existing form of residential development in Edmonton and projects this development into the future, it is clear in many areas in which Ring Road segments are planned that residential development is imminent. This being the case, it necessarily follows that some form of transportation system will have to be devised to service these developments. Roads and arterial highways will be constructed to connect new suburbs with existing segments of the City.

It is within this context that one of the benefits of Ring Road Corridors can be anticipated. Since there appears to be little doubt that development in the City will eventually reach and extend beyond the Ring Roads, is it not likely that optimal transportation systems will be approached more readily by planning for Ring Roads now in conjunction with other facets of city road and highway facilities? Thus, one potential benefit of Ring Road Systems is that they will

permit a higher level of integrated planning than will occur in their absence.

Planning with regard to Ring Road Systems can take many forms. The most obvious is planning the transportation inter-relationships between the Ring Roads and the other elements of city transportation systems, e.g., roads, freeways, rapid transit, and bus systems. Less obvious is the planning relationships between the Ring Road System and the other elements of public programs which will relate to it. For example, utility system planning can be influenced by the Corridor Concept around which the Ring Road discussion revolves. Park and recreation planning should be closely related to Ring Road Systems and the benefits which flow from park and recreation facilities can be importantly influenced by the manner in which they are made more accessible by Ring Roads.

Part of the rationale of reserving a Corridor from which plans for transportation, utility, and recreation systems can derive is to prosper from the experience of other cities. Some cities have planned wisely with regard to Ring Roads and population growth; some cities have planned badly in this regard; and other cities have not planned at all. However, cities with the growth potential of Edmonton need to explore carefully the implications of non-planning in this regard and to contemplate the record of other city experience. This, incidentally, does not imply that Ring Roads have always proved to be the source of massive benefits - witness the case of Winnipeg and its Ring Road which is too far away from the city to provide a vital ingredient of the city's transportation system. The Winnipeg case, however, proves the case for integrated planning more than anything else. It also demonstrated that there are conditions in which Ring Road Systems are not necessarily efficient investments of public funds - depending, perhaps, upon size, growth prospects and precise placement of the Ring Road.

In summary, then, one set of benefits which would flow from Ring

Roads derives from improved form, structure and function of roads which will develop in the areas of the proposed Ring Roads in any event.

3. Recreational Facilities and the Ring Roads

Enough has been said in previous sections to indicate that one of the major categories of benefits associated with Ring Road development is recreation. Briefly, it is only necessary here to illustrate again the diverse set of recreational benefits to which Ring Roads can contribute.

Ring Roads themselves, properly developed with greenbelt parkways on either side, provide one form of recreation directly to the family which finds pleasure in riding in pleasant surroundings. Attendant to this activity are those that could be conducted in close physical relationship with the Ring Roads such as cycle and equestrian paths.

Another level of recreational potential associated with Ring Roads is the park and picnic facility made available on land contiguous to the Corridor and which represents additional family recreational potential in urban areas.

One step from this is a similar benefit. This development is the urban, regional or provincial park which is designed and planned in conjunction with the Ring Roads but which may be separated from the Corridor by some distance and which offers additional recreational opportunity to the park and picnic facility referred to above.

Yet another recreational benefit related to the corridor is the easier access it affords urban dwellers on their way to mountain parks, provincial parks, other provinces, etc., some distance away from the urban area. This is essentially a bypass function affording the opportunity to leave the City with a minimum of traffic congestion and delay.

The general category of bypass benefits will be discussed in more detail subsequently.

While this brief discussion is probably not exhaustive of the recreation benefits Ring Roads might provide, it does provide the necessary emphasis on multiple systems of benefits which carefully planned Corridors offer urban and suburban dwellers.

4. The Problem of Truck Traffic

While it is useless to deny the contribution that truck traffic makes to the flow of goods and services in modern society, all urban dwellers at one time or another have wondered whether the benefits of truck traffic outweigh their external costs in the form of lost time, noise, air and scenic pollution of the environment. The contribution they could make to maintaining the benefits of truck traffic while minimizing the costs is one of the potential benefits Ring Roads provide, if only on a modest scale.

In this regard, we should first of all deflate some of the romantic notions that might be associated with Ring Road development and truck traffic. The most serious problem growing out of truck traffic in urban centres is the fact that so many of them have an inner city destination. Ring Roads will not remove the requirement that goods be transported to commerical centres in the inner cities. But they could have at least a minor impact on inner city traffic congestion if certain things occur. First, if a Ring Road redirects some commercial establishments to the periphery of the City away from the inner city, then some measure of traffic relief may be afforded. This prospect is not without external costs to business firms in established centres whose business declines, but is of benefit to the commercial customer who has greater access to facilities with minimal traffic congestion.

A second element relating to truck traffic has also been referred

to briefly. This is the possibility of dispersing truck terminals, warehouses, etc., away from the inner city and to land contiguous to the Ring Roads. In this regard, substantial relief from inner city traffic congestion is at least possible. This is essentially a city bypass benefit. Ordinarily, in a City such as Edmonton, there is not a great deal of bypass traffic in the sense that large number of cars and trucks pass through the City en route to other destinations. Edmonton is primarily a terminal City for truck traffic. But the bypass activity described here relates to Ring Roads designed to minimize the flow of truck traffic to and through the City and thus serving an inner city bypass function.

5. The General Bypass Benefit

Bypass benefits, of course, are not solely related to truck traffic. It has already been noted, that while bypass traffic represents a small percentage of traffic flow in and around Edmonton, some benefit would attach to a Ring Road which made the bypass possible. In Edmonton, the bypass traffic would relate primarily to cars and trucks on the Yellowhead Highway and also traffic destined to Calgary and Banff. Moreover, as Ft. McMurray realizes the potential of the oil sand deposits, traffic to and from that northeastern Alberta city will also derive some benefit by driving around rather than through Edmonton.

The bypass benefits of the proposed Ring Roads are probably modest; on the other hand, they are too significant to ignore.

6. The Major Benefit - More Efficient Traffic Flow In and Around the Cities

While the above list of benefit considerations add an important dimension to the possible justification of Ring Road Corridors, ultimately the proposal must meet the test of making a significant contribution to the flow of vehicular traffic in and around the City. Major

traffic problems in most urban centres, Edmonton included, relate to the peak load traffic generated by the return trip to and from work. It has been mentioned that the Ring Road Corridors, at least in the short term, will not directly lessen traffic congestion caused by work trips in the sense that they will not provide alternate routes to job destinations within the inner city or other employment centres far removed from the Corridors. That is, many job-bound workers will have to use those parts of the transportation systems that radiate inward to job centres. Thus, if Ring Roads are to have a significant impact on work trips, they will have to be carefully coordinated with other elements of the transportation systems in order to provide direct access to penetrator modes of transportation.

This suggests that one benefit of the Corridors will be the more even distribution of traffic from residential population around the Ring Roads to the various kinds of penetrator systems built into the overall transportation system. For example, if the City is able to generate some form of light rapid transit system which provides access from the Corridor to the inner city, it is easy to imagine large-scale use of the Ring Roads as collectors for rapid transit patrons. With large parking areas contiguous to a Corridor Rapid Transit Station, the Ring Road would then provide a facile mechanism for collecting traffic from suburbs for ultimate transport to the inner city via rapid transit and high-speed buses.

Another example of benefit which would derive from Ring Roads as feeders to city-bound workers would be their potential impact on collecting and dispersing work trips to a larger set of penetrator arterial roads into the inner city. That is, Ring Roads would provide a wider area of choice for workers contemplating alternative penetrator roads into the interior cities. Without a Ring Road, a worker might feel compelled to choose the nearest arterial road to his neighbourhood. With a Ring Road, a worker might feel freer to choose from a wider assortment of penetrator roads since this wider set would be available because of time savings made possible by travel along the Ring Roads.

[illegible] live in a suburb some distance removed from job locations which [illegible] the drivers who reside in it. Direct or full cross-town passengers, and those jobs are in the industrial area in the east side of the city, [illegible] represents the east segment of the proposed Edmonton Ring Road.

One of the most interesting applications of ring roads for suburban [illegible] is in the case of Edmonton. Here, it can assist ring roads [illegible] city. That is, if light rapid transit becomes available in Edmonton within the next decade, their optimal use will be facilitated by ring road collector systems.

By the same token, since optimal ring road use is dependent upon other penetrator systems in the inner city and in other zones in Edmonton, best use of ring roads will also require improvements in arterial roads, and, possibly, freeways, to which ring road connections [illegible].

The shopping trip in urban centres is not as insignificant in transportation terms as the work trip because it occurs frequently [illegible] and light and therefore does not present a problem. Thus the impact of ring roads in the matter of shopping trips is necessarily of less significance than that of work trips.

However, the impact of ring roads in shopping trips is essentially a matter of consumer convenience. In the first instance, a ring road will permit easier access to the same set of penetrator modes of transportation into the inner city as discussed under work trips, namely, light rapid transit, high-speed buses and arterial highways. Secondly, ring roads are likely to provide significant alternatives to shopping trips to urban centres because the corridors themselves tend to attract a new set of regional shopping centres at points of intersection between penetrator highways and the ring roads.

The discussion of Ring Roads in relation to work trips and shopping trips has emphasized their potential impact on the traffic flow within the City of Edmonton. Ring Roads, on the other hand, can also be viewed in relation to their incorporation to the regional highway system which accommodates rural as well as urban traffic. We have alluded to this previously in relation to recreation trips by urban dwellers whose access to points outside the cities is improved by the existence of Ring Road Corridors. The other dimension of the relationships is how well the Ring Roads mesh with the regional transportation systems, of which they are part, and the flow of benefits which may accrue to highway users outside the City of Edmonton. Benefits from Ring Roads will develop as a function of at least two elements in relation to the regional highway system. The bypass benefit has already been discussed and need not be repeated here, except to note the cumulative nature of bypass benefits when truck traffic dispersion is considered. The second benefit provided by Ring Roads in relation to regional highway systems is the way in which they are capable of dispersing traffic to various sections of the cities as that traffic funnels into the urban complex. Under existing transportation systems, there is a natural tendency for feeder traffic into the cities to concentrate on the main highways, such as the Edmonton-Calgary Freeway (Highway #2), the Yellowhead Highway, and so on. Some of this feeder traffic is not destined for downtown or to a single destination but still tends to concentrate in the principal feeder systems. Therefore, one of the contributions Ring Roads can make is to use specific segments of the Ring Roads to disperse traffic to specific areas of the cities without unnecessary use of congested traffic arteries. For example, a person travelling from Red Deer to a residence in West Jasper Place in West Edmonton or Castle Downs to the North, will be able to use segments of the Ring Road without penetrating the downtown core.

While this kind of downtown bypass traffic does not occur in massive volumes, it is one of the benefits of Ring Roads which should be included in the cumulative effect.

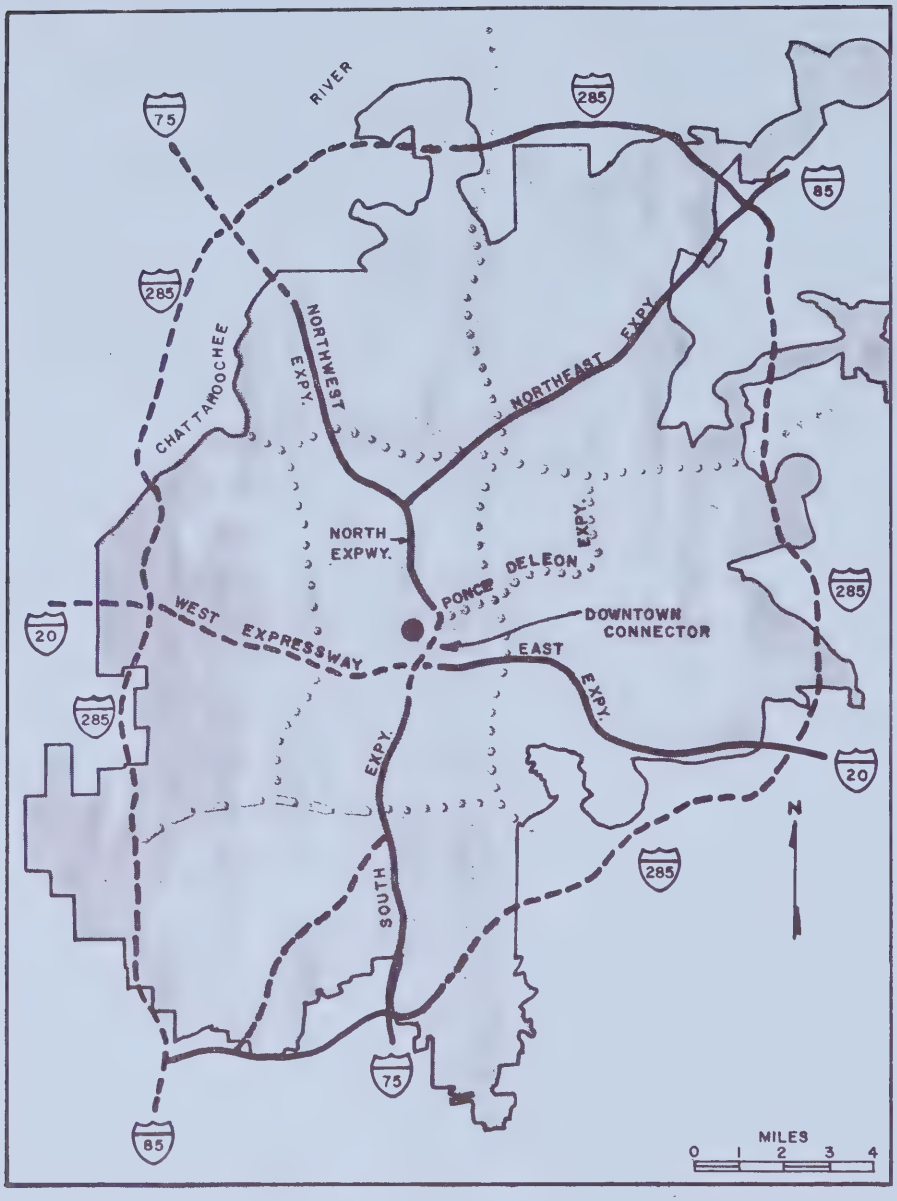
It is worth repeating for purposes of emphasis that one of the most important implications of this discussion of benefits flowing from Ring Roads in relation to the fundamental problem of city traffic flow is that the optimal use of Ring Roads will probably require simultaneous public investment in other transportation systems which ease the flow of traffic to urban centres for peak-hour work trips. Clearly, improved arterials, bus systems and the introduction of light rapid transit are necessary elements in the optimal use of Ring Road Corridors.

Other Considerations

One of the troublesome aspects of the development of the Outer Ring Roads is their apparent lack of planned relationship to Inner Ring Roads. While there are penetrator roads connecting the Outer Rings with the Inner Rings, little analysis emphasizes the functional relationship between the two Ring Systems. We have already referred to the experience of Winnipeg, which emphasizes the need for careful planning of Ring Road location. We have likewise referred to Washington, D.C. where the Capitol Beltway has had a massive impact on the orderly flow of traffic between Washington, D.C. and its Maryland and Virginia suburbs and between the suburbs themselves. Toronto has successfully developed Ring Road segments although perhaps in an inadequate way. The American cities of Boston, Jacksonville, Atlanta, Houston and Dallas have experimented successfully with Ring Roads, although what was originally considered Outer Rings have become Inner Rings in some instances. Similarily, some European cities have introduced ring roads with gratifying results.

The most significant conclusion one can draw from the experience of other cities is that for the most part Ring Roads have become a vital part of the overall transportation system. However, this success has been partly a function of size. In some of the most interesting applications of Ring Roads the population far exceeds that of Edmonton. Some idea of the physical and population variables relating to the experience of American cities is shown in Figures 9 through 15.

FIGURE 9

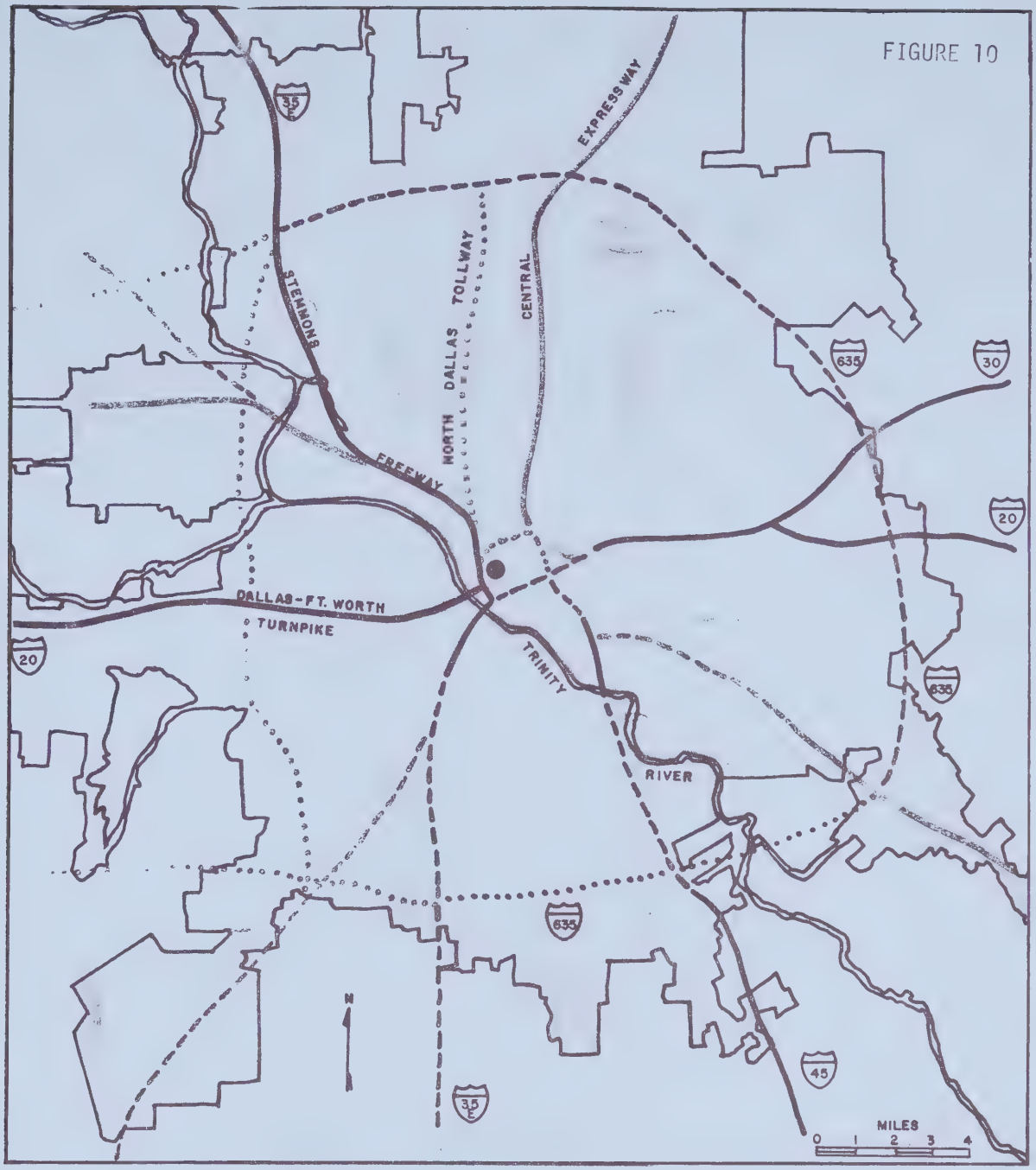


ATLANTA

STATISTICS

	Central City	Suburban Area	Total Urbanized Area
Area (sq. miles)	128	118	246
Population	487,455	280,670	768,125
Persons per sq. mile	3,802	2,387	3,125
Private Automobile Registration	132,049	101,409	233,458
Persons per Automobile	3.7	2.8	3.3

FIGURE 10



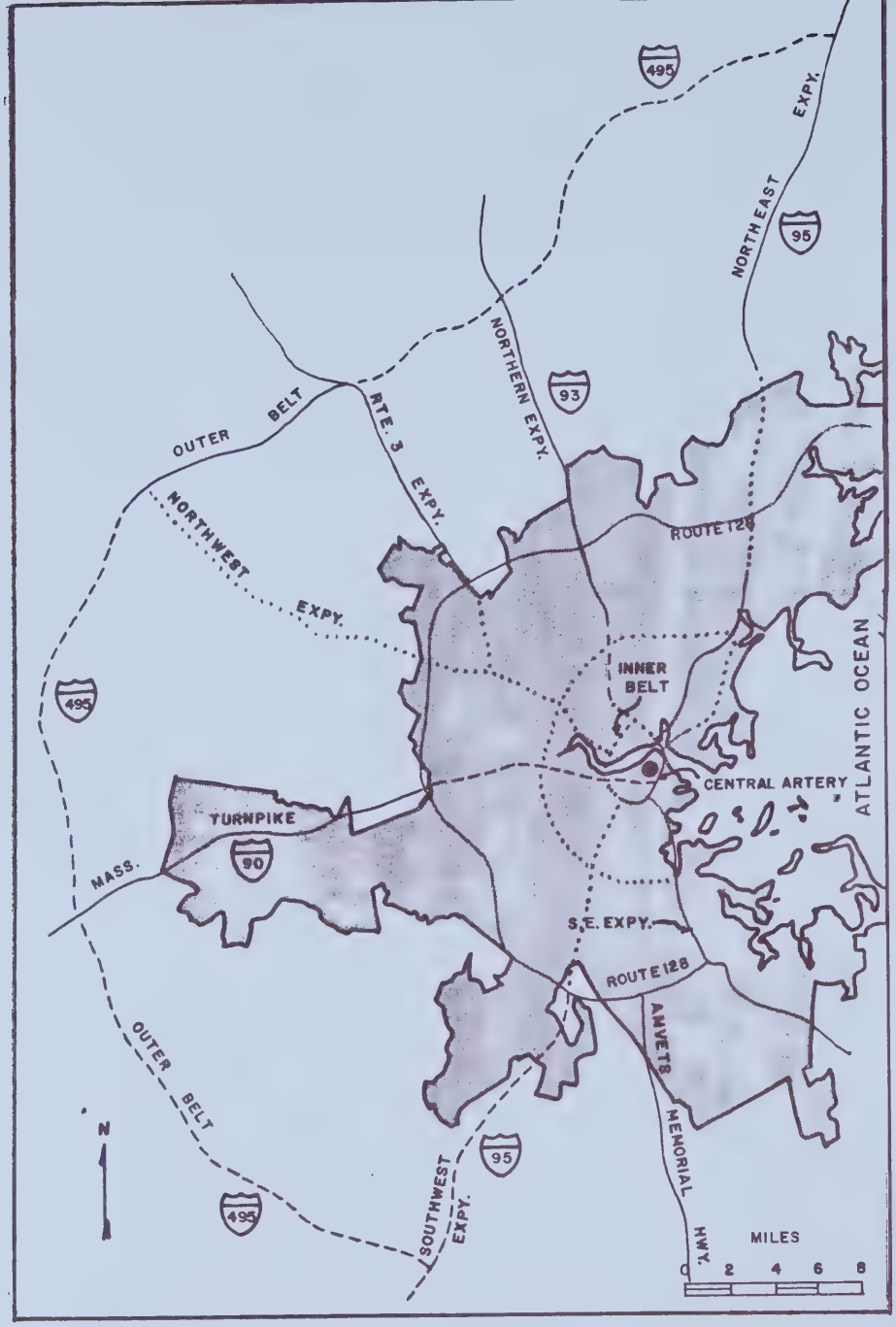
Central Business District ● Urbanized Area Limits ▭

DALLAS

STATISTICS

	Central City	Suburban Area	Total Urbanized Area
Area (sq. miles)	280	367	647
Population	679,684	252,665	932,349
Persons per sq. mile	2,428	688	1,441
Private Automobile Registration	244,561	99,391	343,952
Persons per Automobile	2.8	2.5	2.7

FIGURE 11



Central Business District ●

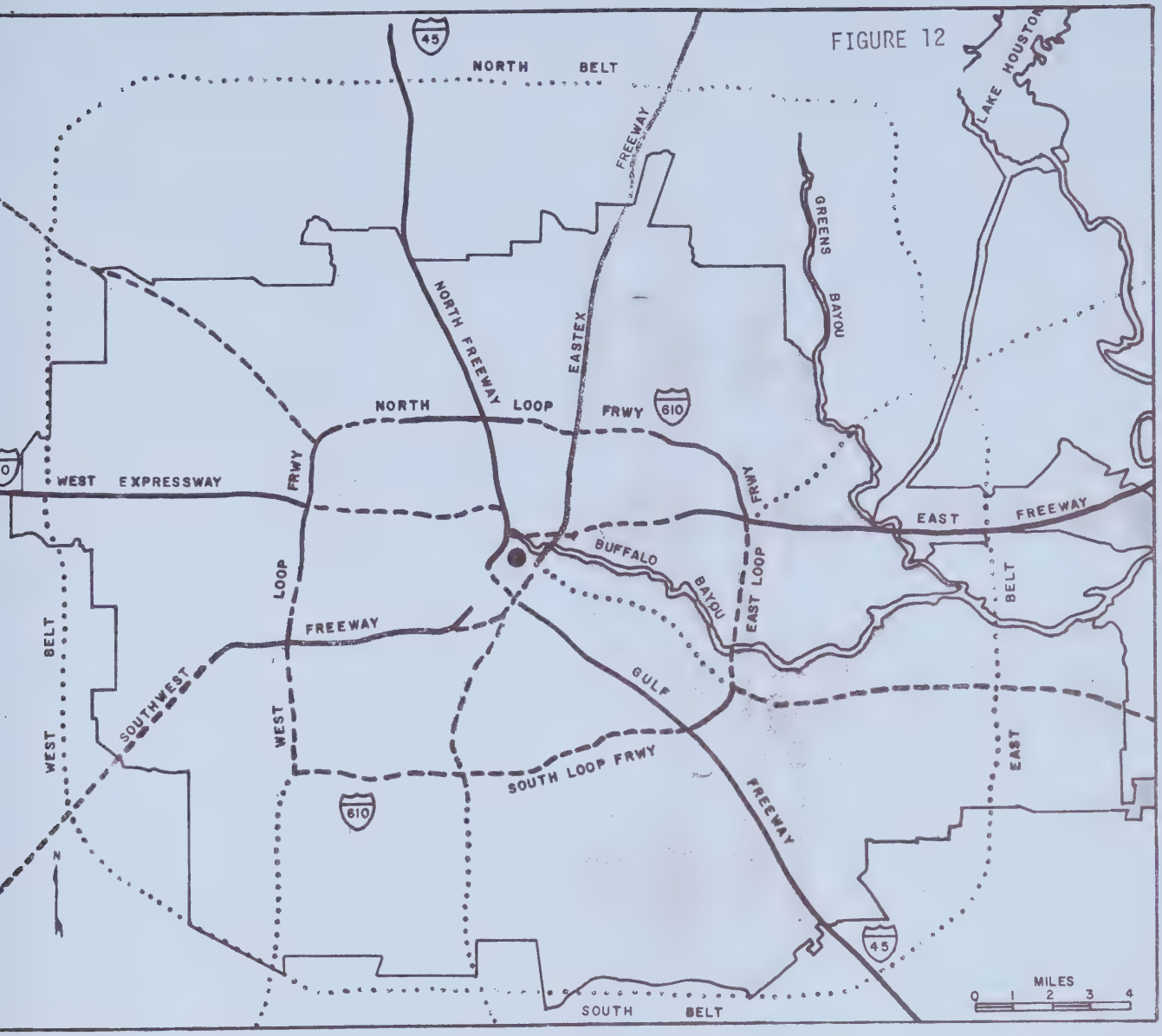
Urbanized Area Limits ▭

BOSTON

STATISTICS

	Central City	Suburban Area	Total Urbanized Area
Area (sq. miles)	48	468	516
Population	697,197	1,716,039	2,413,236
Persons per sq. mile	14,586	3,667	4,679
Private Automobile Registration	135,674	507,311	642,985
Persons per Automobile	5.1	3.4	3.8

FIGURE 12



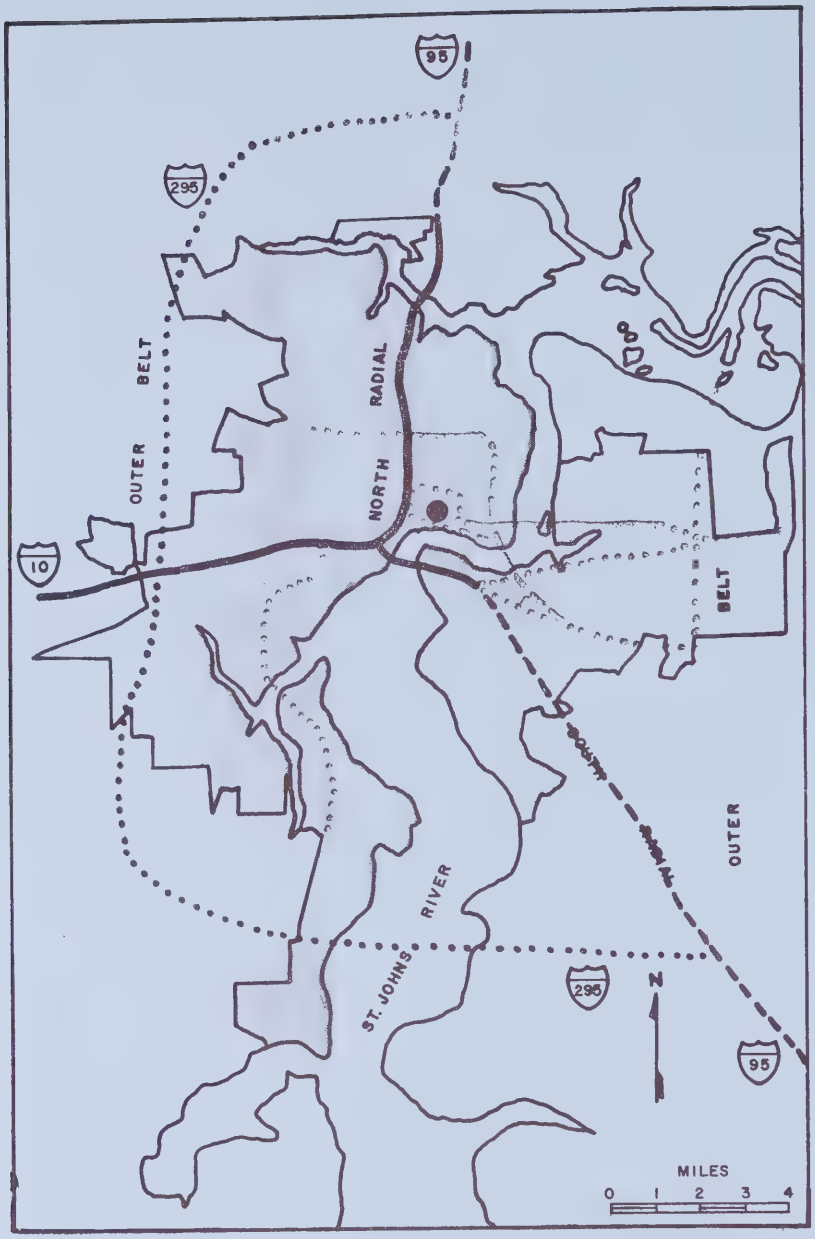
Central Business District ● Urbanized Area Limits ▭

HOUSTON

STATISTICS

	Central City	Suburban Area	Total Urbanized Area
Area (sq. miles)	328	102	430
Population	938,219	201,459	1,139,678
Persons per sq. mile	2,860	1,967	2,647
Private Automobile Registration	316,764	73,335	390,099
Persons per Automobile	3.0	2.8	2.9

FIGURE 13



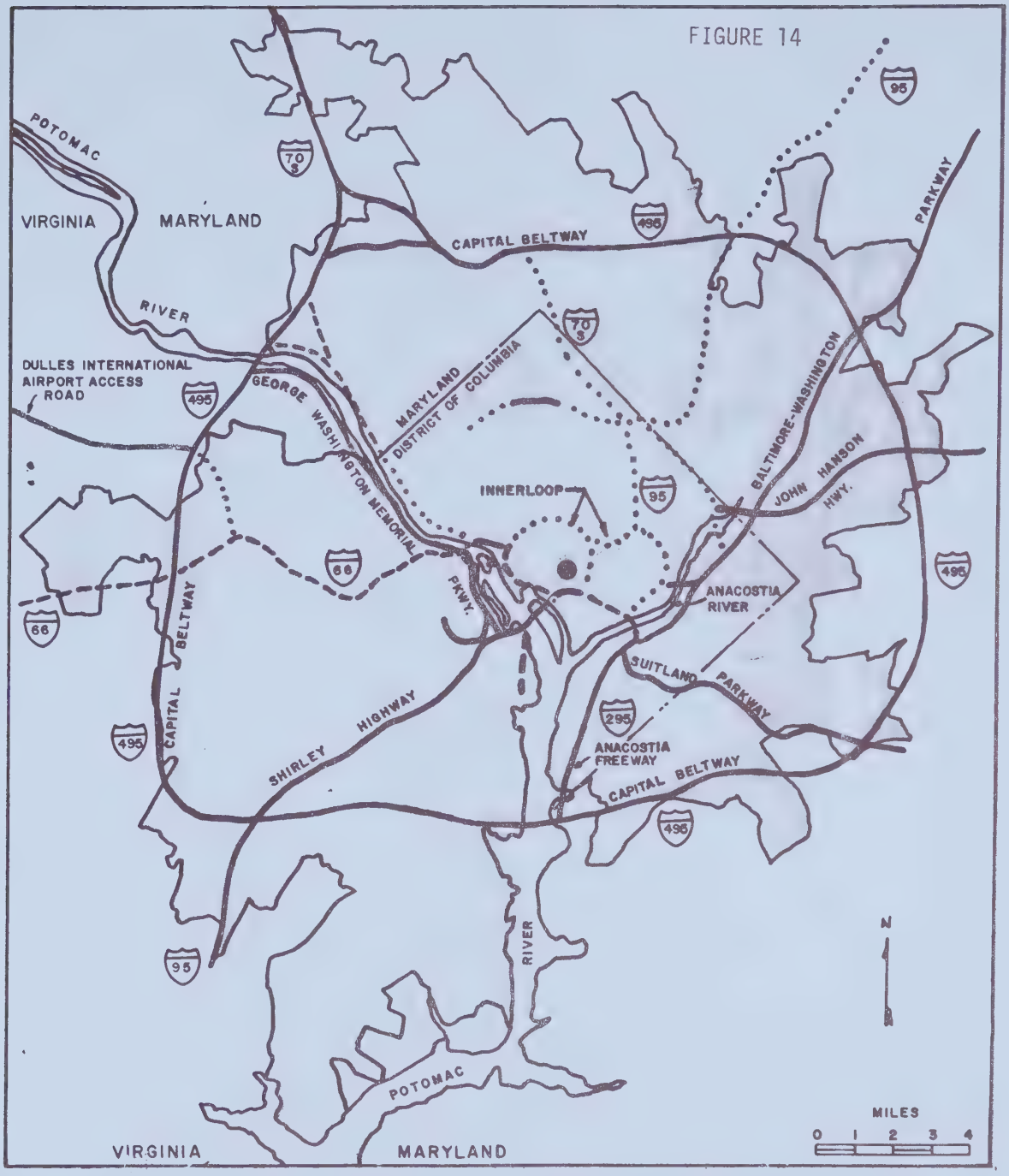
Central Business District ● Urbanized Area Limits ▭

JACKSONVILLE

STATISTICS

	Central City	Suburban Area	Total Urbanized Area
Area (sq. miles)	30	81	111
Population	201,030	171,539	372,569
Persons per sq. mile	6,657	2,113	3,344
Private Automobile Registration	50,907	60,123	111,030
Persons per Automobile	4.0	2.9	3.4

FIGURE 14

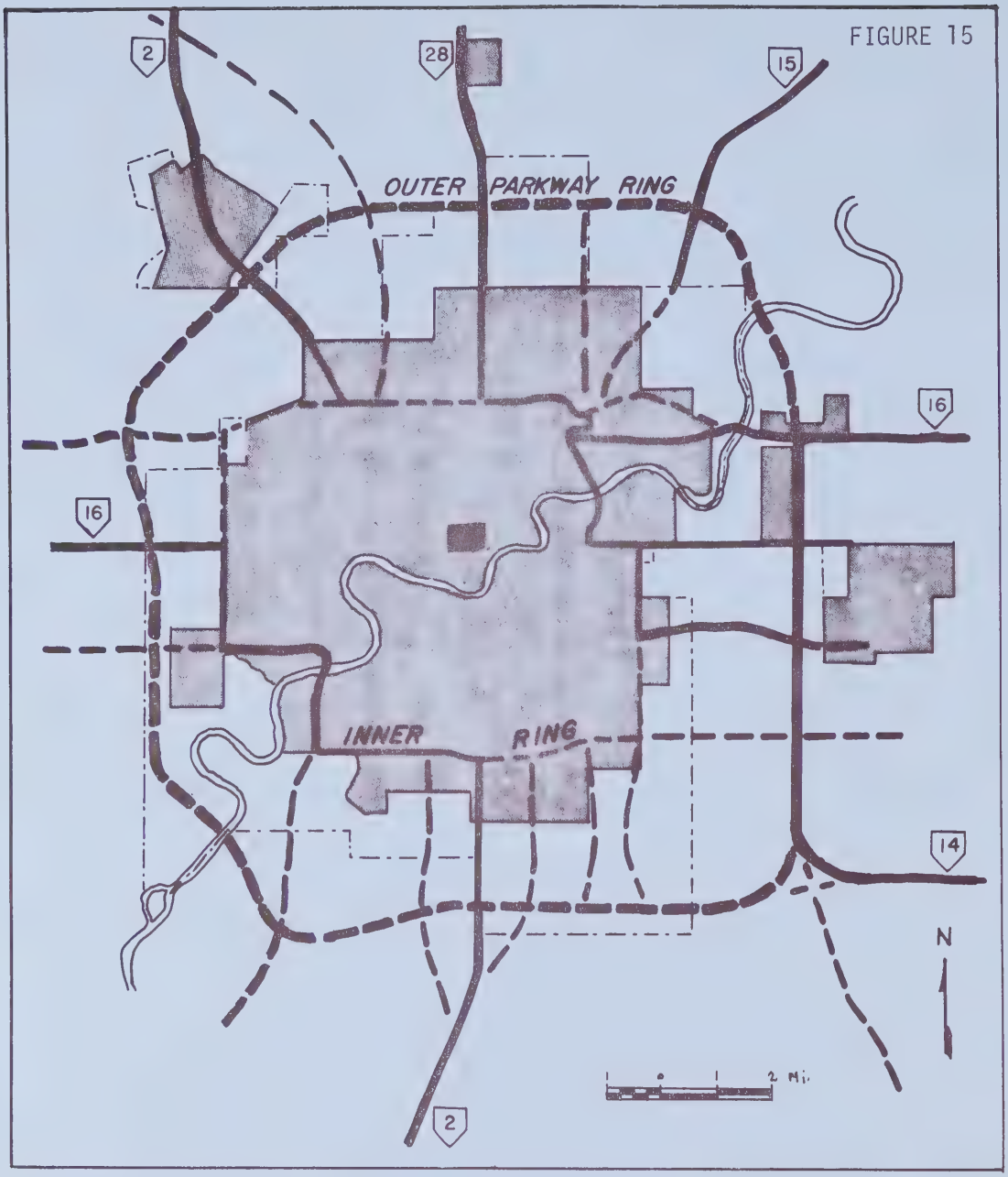


WASHINGTON D.C.

STATISTICS

	Central City	Suburban Area	Total Urbanized Area
Area (sq. miles)	61	279	340
Population	763,956	1,044,467	1,808,423
Persons per sq. mile	12,442	3,740	5,308
Private Automobile Registration	159,589	357,958	517,547
Persons per Automobile	4.8	2.9	3.5

FIGURE 15



Central Business District ● Urbanized Area Limits ▭

EDMONTON

STATISTICS (Metropolitan Edmonton)

Area (City Limits in sq. miles)	122
Population (1972 estimate)	450,641
Persons per square mile	3,694
Private Auto Registration	171,000
Persons Per Automobile	2.63

Priority and Staging Considerations

The proposed Ring Road Corridor around Edmonton will become feasible and reach optimal efficiency only to the extent that it is carefully integrated into the urban transportation systems of the City. Since the principal objective of such urban transportation systems is to expedite the flow of people and commodities safely and at least cost, the Ring Roads must mesh with this traffic flow objective. Thus, the Ring Road should be considered a basic element of the system, rather than a separate entity with a justification of its own.

To reach optimal efficiency, then, the Ring Road should be developed in conjunction with three other elements of the urban transporation system: rapid transit; improved arterials and penetrator roads and highways; and public transit via express and neighbourhood buses. Hence, the development of the Ring Road becomes primarily a question of staging land acquisition and construction in relation to the continued development of other elements of the system.

The Ring Road, seen in this light, is not to be viewed as an alternative to, say, urban rapid transit systems, but rather as a mechanism for making these rapid transit lines work more effectively. It follows that the Ring Road should be developed in such a way and at such a pace as to assume its integration with other elements of the system.

From the perspective of priorities, therefore, a fundamental question is the relative payoffs between expenditures for expediting urban traffic flows and expenditures for expediting rural traffic flows. On the basis of numbers alone, urban population are an obviously important determinant of expenditure.

On the other hand, one of the benefits that will flow from Ring

Road Corridors relates to the integration of the urban and regional transportation systems. Thus, we are not suggesting that either an urban or rural transportation system can be developed to the exclusion of improvements in the counterpart system.

It may be some time before Edmonton requires the full Corridor capable of moving traffic on a divided highway, four-lane basis. If, however, it is decided that Ring Road Corridors should be available at some future point in the development of the City, then the land acquisition stage of activity is probably at hand.

In contemplating the dimensions of land acquisition requirements, we should first return to the concept of multiple use which must be invoked if the Ring Roads are to be justified. The many public purposes which a land Corridor around the City could serve have already been noted. But these purposes require a larger land base than would a Corridor designed to serve traffic flows alone. Therefore, a first implication of the multiple use objectives is a Corridor of sufficient size to meet the needs discussed earlier in this report. These needs probably demand an expenditure for land acquisition far in excess of the Provincial Government estimate.

However, there may be methods which can be used which will minimize current costs of land acquisition. One of the urgent requirements of an action program is for appropriate studies of land acquisition techniques used in other parts of North America and legal and legislative analysis of land acquisition alternatives in Alberta. It is not enough to assume that the land in and around Edmonton will appreciate enough to justify immediate acquisition. This ignores the opportunity costs of using funds for this purpose rather than for the accomplishment of other public and private programs.

Other elements of the staging of Corridor development are implicit in an earlier discussion of traffic flow. It will not be necessary to

consider the simultaneous construction of the various segments of the Ring Roads because the traffic flows suggest construction staging according to most intensive use of the various segments.